S·A·E Journal

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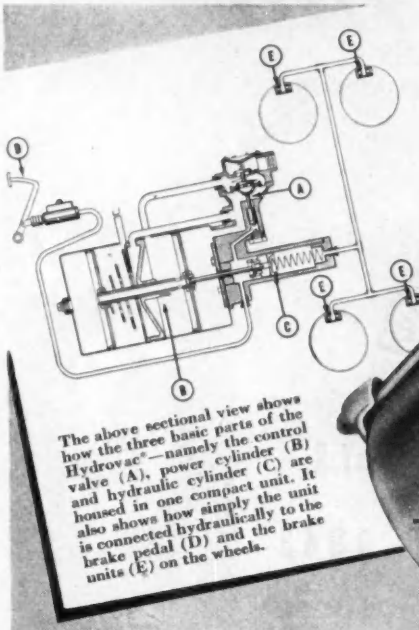
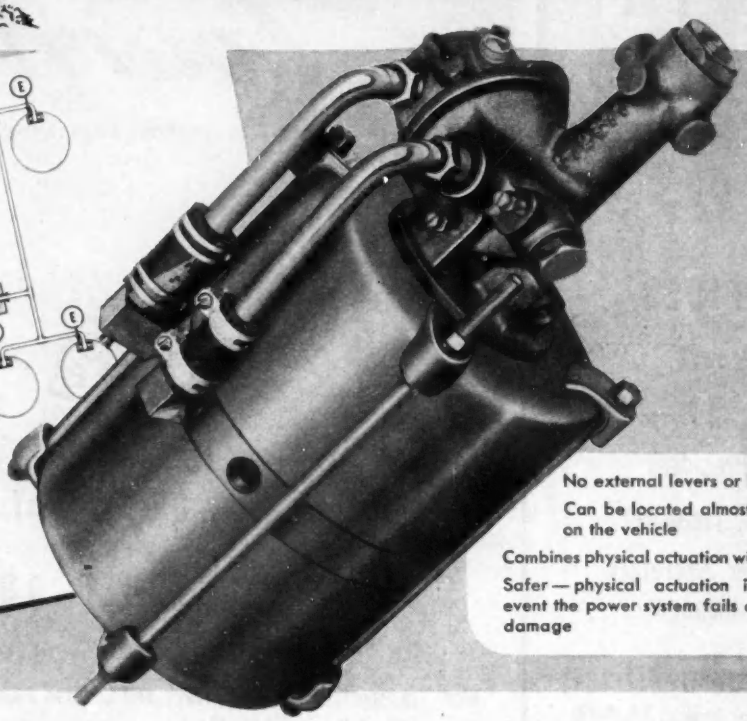
OCTOBER 1943

Building for a better world tomorrow...

HYDROVAC* THE "ONE-UNIT" SYSTEM



The above sectional view shows how the three basic parts of the Hydrovac*—namely the control valve (A), power cylinder (B) and hydraulic cylinder (C) are housed in one compact unit. It also shows how simply the unit is connected hydraulically to the brake pedal (D) and the brake units (E) on the wheels.



No external levers or links

Can be located almost anywhere on the vehicle

Combines physical actuation with power braking

Safer — physical actuation is unimpaired in event the power system fails due to accidental damage

THIS NEWEST *BENDIX* VACUUM POWER BRAKING SYSTEM SIMPLIFIES PRODUCTION AND MAINTENANCE . . . . . .

For safe, quick stopping of military vehicles, Uncle Sam uses thousands of Hydrovac Vacuum Power Braking units. They are important members of "The Invisible Crew" of precision equipment which more than 30 Bendix Plants are speeding to world battle fronts.

Hydrovac—the newest B-K* Vacuum Power Braking system—combines, in one compact unit, a hydraulically actuated control valve, a tandem-piston power cylinder and a hydraulic cylinder. By eliminating all need for external levers and links, the Hydrovac system not only speeds up the *manufacture* of trucks, half-tracks, tanks, and other military vehicles, but also greatly simplifies their *maintenance* in the field.

The Hydrovac is available now only for military vehicles. It is but one of many Bendix* peacetime products which are being further improved while serving Uncle Sam and which will be again available for civilian transportation when victory is won.

In the meantime, Bendix is continuing to supply, insofar as military requirements permit, other automotive replacement parts which are needed by service stations to keep war-essential civilian vehicles on the job.

THE INVISIBLE CREW
Precision Equipment by Bendix
AVIATION CORPORATION

BENDIX PRODUCTS DIVISION
South Bend, Indiana

**Trademark of Bendix Aviation Corporation*

STROMBERG* CARBURETORS • BENDIX B-K* VACUUM POWER BRAKES
BENDIX* BRAKES • BENDIX-WEISS* UNIVERSAL JOINTS • BENDIX* CLEANERS

AMONG THE SPEAKERS of the West Coast T&M meeting were, L. to R.: P. W. Drew, Goodyear Tire & Rubber Co.; S. B. Shaw, Pacific Gas & Electric Co.; Charles C. Morris, U. S. Public Roads Administration, and Lt.-Col. Charles G. Gallagher, Army Ordnance Department

Sherer G. Culver, Key System, Oakland, was general chairman of the West Coast T&M Meeting

War Transportation

Army, Navy and Civilian Fleet Problems Analyzed at West Coast T&M Meeting

DOUBTS were raised as to the efficacy of synthetic rubber tires for heavy duty vehicles, and fantastic visions of post-war cargo plane operation were dimmed at the SAE West Coast Transportation and Maintenance Meeting, San Francisco, during the three-day meeting Aug. 19 to 21. The event was staged under the sponsorship of the Northwest, Oregon, Southern California and Northern California Sections of the Society, with the latter serving as host. Sherer G. Culver, Key System, Oakland, was general chairman of the meeting, which was held at the Palace Hotel.

In the opening session, P. W. Drew, Goodyear Tire and Rubber Co., cited the inherent deficiencies of the synthetic materials available to tire manufacturers in comparing GR-S with the natural product. He pointed out that this material:

1. Develops too much heat when flexed,
2. Loses extensibility when hot, and
3. Has low tear resistance when hot.

Explaining the first point he said: "Heat developed in flexing is due to the synthetic rubber's high hysteresis loss. This is not critical in end-products having low flex or that are thin-walled and have a low angle of flex. But in truck tires this is one of the biggest deficiencies we must learn how to live with. High-speed trucks of today tax natural rubber to the full, and any additional heat build-up creates more heat in the tire, which reduces the strength of the cotton carcass to an alarming degree. Substituting rayon for cotton cord is one answer, but this has been done in tires for so-called 'murder runs.' But if used on all truck tires it would only compensate for additional heat build-up of synthetic rubber and the ability to build a tire for hot service conditions would be lost," he predicted.

"Designing a synthetic tire must take into account known deficiencies of the material. Although tires have been produced which are showing such promising results that many manufacturers claim synthetics are better than natural rubber tires, this seems too much to expect. Our aim is to make synthetic tires as near the quality of natural rubber as possible. If we can accomplish this aim within 85 to 90%, it will be a first-rank scientific achievement," he said.

SYMPOSIUM SPEAKERS at the T&M dinner included, L. to R.: G. A. MacGillivray, Eutectic Welding Alloys Co.; D. N. Harris, Shell Oil Co.; F. W. Kavanagh, Standard Oil Co. (Calif.); Fred E. Barth, National Motor Bearing Co.; R. A. Watson, Federal-Mogul Corp., and E. V. Berry, Precision Engineering Co.

SAE President Mac Short addressing the luncheon meeting of the West Coast T&M Meeting, with Dr. A. G. Cattaneo, chairman, Northern California Section, who presided

Ray D. Kelly, chairman, SAE Membership Committee, reported on membership increases and congratulated the four West Coast Sections

The speaker pointed out that the status of the changeover from rubber to synthetic tires was about as follows:

First-class passenger tires were changed over July 1.

Small truck tires – up to 9.00 cross-sectional diameter – changed over July 19.

Large truck tires are now in the process of testing before changeover. It is hoped that this change can be made by Oct. 1.

"This is the problem today, with the Government standard synthetic rubber that must be produced to obtain projected production out of approximately $700,000,000 worth of synthetic rubber plants that have been built or that will soon be completed. We can expect many improvements in synthetic rubber, but must produce tires of this material until demand for all types of tires is somewhat dissipated.

"Although the facts make a rather gloomy picture, we believe the tire industry chemists and engineers are equal to the task of making a satisfactory tire out of this material," he said.

Discussion of Mr. Drew's paper developed the information that:

Synthetic truck and bus tires, sizes 10.00 and up, must be run at speeds less than 35 mph at temperatures of 110 F and over;

American-made synthetics are not in all respects as good as some "captured" tires;

Natural rubber cement must be used in rebuilding synthetics;

There will be less trouble from synthetic tubes for passenger cars than casings (butyl will be used), and

Synthetic tubes for truck tires as yet are an unknown quantity.

History of T&M Project

Present SAE-ODT maintenance activity is the direct result of an incident that took place in San Francisco in June, 1939, according to an explanation by S. B. Shaw, Pacific Gas and Electric Co., project chairman, SAE-ODT T&M Committees 12, 13 and 17. A small group of men attending the World Automotive Engineering Congress of the SAE in San Francisco were having a breakfast discussion. Out of it came a proposal to organize committees to study operating and maintenance problems.

In January, 1941, under the presidency of A. T. Colwell and with Col. T. L. Preble, then vice-president of the Society, as chairman, the T&M Activity project committees were organized. Lt.-Col. Harry O. Mathews, then automotive engineer for the Public Utility Engineering and Service Corp. of Chicago, was the first chairman of the coordinating committee. The succeeding chairman was W. J. Cumming of the Surface Transportation Co., New York, now chief, Vehicle Maintenance Section, Division of Motor Transport, ODT.

Report on Projects

Ellis W. Templin, Los Angeles Bureau of Power and Light, project chairman, SAE-ODT, T&M Committees 6, 8, 11, and 30, presented an abridged report on the accomplishments of the SAE work with ODT. He directed attention to a variety of reports on maintenance methods which have been completed, printed by the Government, and distributed.

On project No. 14, "Preventive Maintenance and Inspection Procedure," he said: "The best preventive maintenance and inspection procedure is one designed to show what should be done and when it should be done to obtain maximum reliable service from each vehicle at the minimum cost.

Wallace Linville, General Petroleum Corp. of Calif., chairman of Southern California Section, was session chairman.

On the subject of "Motor Transportation

Ellis W. Templin, who reported SAE T&M war projects, is the Society's vice-presidential nominee for T&M

SESSION CHAIRMEN included Wallace Linville (center) General Petroleum Corp. of Calif. and Z. C. R. Hansen, (right) International Harvester Co., shown here with S. B. Shaw (left), one of the speakers

SPEAKERS INCLUDED L. to R.: E. N. Hatch, American Brake Shoe & Fdy. Co.; J. B. Kendrick, Vega Aircraft Co.; Thomas Wolfe, Western Air Lines, and Roy Long and W. R. Sheehan, both of the Office of Defense Transportation

Prof. W. H. Paul, Oregon State College, who was chairman of the dinner symposium

for the Duration," Roy Long, Division of Motor Transport, Region 9, ODT, speaking Thursday afternoon, said that truck operators are pioneers and known for their ruggedness of approach in order to forge their way through trying conditions and in the face of complex circumstances.

Discusses Material for Parts

First-hand information on materials for automotive replacement parts during the fourth quarter was revealed by W. R. Sheehan, San Francisco District, ODT, who discussed "What the Future Holds in Store for Parts."

He said the Requirements Committee of the War Production Board has allocated materials and percentages of increases over the third quarter as follows: carbon steel, 150%; alloy steel, 164%; copper-sheet and strip (3011), 284%; copper base alloy-rod, bar, wire (3021), 223%; copper base alloy-tube, pipe (3041), 243%; copper-unalloyed (3051-61-71), 219%; copper wire (3101), 210%; copper and copper base alloy-foundry (3201), 350%; aluminum castings, 155%.

Earl A. Marks, Earl Marks Electrical Service, Northwest Section, presided.

Alaska Highway Described

Thursday evening was devoted to an illustrated lecture on the Alaska Highway by Charles C. Morris, U. S. Public Roads Administration. He said there is a probability the road will be extended from Fairbanks to the Behring Sea in the vicinity of Nome. Access roads now are being built. Last winter, temperatures as low as —72 F were experienced. General Chairman Culver presided, and the films were shown through the courtesy of the Caterpillar Tractor Co.

Army Supply and Maintenance

In a paper delivered Friday morning, Lt.-Col. Charles G. Gallagher, Ordnance Depot, Stockton, Calif., dealt with "Automotive Supply and Maintenance" as known to the Army.

The driver, he said, is the most important single factor in preventive maintenance. Only through him can the mechanic know what difficulties a piece of equipment is giving.

Col. Gallagher said: "We can fully realize the important job the mobile fleet is playing in this war. The thousands of motor vehicles used by our armed forces involve a tremendous task of supply and maintenance.

"Our equipment is the finest in the world, as has been proven on the field of battle. The finest mechanical engineers in the country have worked relentlessly in making this possible. You gentlemen of the Society of Automotive Engineers can well be proud of the efforts and service given to your country in this gigantic struggle. Let us all continue on in this all-out effort to 'Keep 'Em Rolling.'"

Urges Dissemination of Know-How

"What can the automotive industry – SAE, manufacturers and automotive engineers – do to speed up the necessary training job facing all maintenance men today?" asked E. N. Hatch, American Brake Blok Division, American Brake Shoe & Foundry Co., in his paper, "Preventive Maintenance and Inspection Procedure."

"We cannot hand a maintenance manual to a would-be mechanic and expect him to take it home and read it. He just will not do it, and if you have the exception he could not retain all the information and be able to apply it on the job.

"The point which most of us have overlooked is, however, how to get the information to the mechanic on the job, when he is actually doing the work. The SAE-ODT Committee 17, under Chairman J. Willard Lord (Atlantic Refining Co.), has developed a Standard Practice Instruction card, 14x18 in., now an SAE Recommended Practice, the details of which can be found in the 1942 'SAE Handbook,' pp. 726 and 727."

Discussion of Mr. Hatch's paper revealed that it now is planned to catalogue recommended test procedures. Several said preventive maintenance could well be converted to preventive driving.

Oregon Section Chairman Z. C. R. Hansen, International Harvester Co., presided at the Friday morning session.

An address by Mac Short, president of SAE, was the feature of the luncheon meeting, at which Dr. Alfred G. Cattaneo, Shell Development Co., and chairman of Northern California Section, presided. President Short assured his listeners that in spite of the urgency of the war effort there are sufficient and valid reasons to meet as engineers and exchange experiences.

"We are getting our second wind," he said. "Our Society is getting its and we can pause to look at what is going on and determine what we can do next. Production has about met expectation. So, it is time that we stop to take a look at maintenance, and you men are to be congratulated over the T&M work you are doing.

"We hear of the post-war day to come.

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Brig.-Gen. John Kay Christmas, Ordnance Department's Tank-Automotive Center, Detroit, discussing Army engineering problems at the T&M Dinner

SAE Materials & Processes Session Draws 125

Part of one of the large groups, totaling 125 metallurgists, Army and Navy Officers, and aircraft engineers who met Aug. 24 to 27 in Chicago to review 137 SAE Aeronautical Materials Specifications, recommend changes in 15 Army-Navy and Federal specifications, and adopt rules of procedure. At the head table in the far end of the room are Carleton E. Stryker, Aircraft Resources Control Office, WPB; Capt. S. D. Daniels, AAF, Working Committee, Army-Navy Aeronautical Board; J. D. Redding, SAE Staff Representative; L. D. Bonham, Lockheed Aircraft Corp. and chairman, SAE Airframe Materials & Processes Committee; J. B. Johnson, Materiel Center, AAF, and chairman SAE Aircraft Materials & Processes Coordinating Subdivision, who was chairman of the meeting.

Also, B. Clements, Wright Aeronautical Corp. and chairman of the SAE Engine Materials & Processes Committee; D. T. Booth, Wright Aeronautical Corp.; and Dr. N. E. Woldman, Eclipse Pioneer Division, Bendix Aviation Corp., and chairman of the SAE Accessory Materials & Processes Committee

Little-Used Cars

W.E.B. Warns Owners To Check Frequently

FREQUENT inspections – determined on a time rather than a mileage basis – are needed to keep automobiles that are being operated under low mileage and speed restrictions in operating condition, according to a report compiled by the SAE War Engineering Board for the use of the Automotive Council for War Production.

Preventive maintenance practices that were sufficient when unrestricted driving was the rule must be somewhat modified under the present limited driving – particularly when rations are used for short, start-stop trips that don't give the engine opportunity to become thoroughly warmed up or the battery a substantial charge.

The highlights of the W.E.B. report can be summarized as follows:

1. *Engine Lubrication* – The condition of the crankcase oil should be checked at least once a month in the winter and about once every two months in summer (or after 1000 miles if that occurs first) for sludge and water accumulations.

Hand-operated chokes should be used sparingly, to minimize dilution of the crankcase oil with gasoline. Automatic chokes should be adjusted to avoid excessive richness during warmup. Dilution can also be kept down and fuel saved if the car is operated at as nearly uniform speed as possible, for extra fuel is injected into the cylinder by the accelerating pump each time the accelerator is depressed.

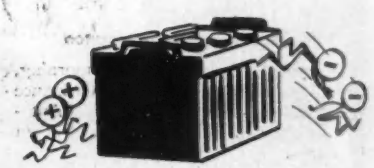
Grill covers, intelligently used, can also aid in cold-weather operation by reducing the engine warmup period, provided care is taken to avoid boiling of the coolant or overheating even for brief periods.

Warm Up Engine

If the car is not in regular use, the engine should be driven (with a blanket over the radiator and hood in winter) about once a week, long enough to warm up the engine thoroughly and then for at least 15 min. longer, at the lowest speed that gives the maximum charging rate for the generator.

2. *Chassis and Running-Gear Lubrication* – The chassis and all the miscellaneous powerplant points should be lubricated at 90-day or 500-mile intervals. Front- and (where construction permits) rear-wheel bearings should be lubricated at least annually. Transmission and rear-axle lubricants should be checked at regular intervals for low level due to leaks, and they should be serviced with the proper lubricants in the spring and fall.

3. *Batteries* – The specific gravity and the level of the fluid in the battery should be checked about once a week. If the specific gravity is less than 1.225, the battery should



be recharged. This is particularly important in winter, because more current is consumed and the battery is apt to freeze if the charge is too low.

Batteries even lose their charge while standing, so that every possible means should be taken to save current – heaters, lights, radios, and the like should be used sparingly.

On cars equipped with third-brush generators, it may be helpful to raise the charging rate – if done with discretion by one who knows how. It may also be desirable to install a smaller generator pulley, so the generator will give its maximum output at a lower road speed. No attempt to increase the charging rate by adjustment to a higher voltage should be made on vehicles equipped with voltage regulators; such practice may lead to burning out lamps and radio tubes and will damage ignition points.

4. *Spark Plugs* – If fouling occurs, hotter approved-type plugs should be installed or the original plugs will have to be cleaned and regapped periodically.

Inspect Rubber Parts

5. *Cooling System* – Rubber deteriorates with time, so rubber parts should be inspected frequently. Fan belts should be kept at proper tension. Leaks in the cooling system should be repaired immediately. The shortage of antifreeze also makes it desirable to save the coolant for next winter, new rust inhibitor being added when the system is refilled.

6. *Muffler* – Mufflers and exhaust pipes should be checked for leaks more frequently, since low mileage operation provides more opportunity for condensation, and hence for corrosion.

7. *Fuel System* – Keeping the fuel tank as nearly full as rations permit, particularly in cold weather, is helpful in minimizing the accumulation of water in the tank. Water should be drained whenever some has accumulated. The water and sediment trap usually associated with the fuel pump should be checked at regular intervals.

Freeing Valves

8. *Sticking Valves* – Valve sticking is frequently encountered in starting a vehicle that has been standing for some time. This trouble may be due to any of the following causes:

a. Rusting of valve stems is caused by condensation of moisture on the exhaust valve stems and in the guides. Low-oil-consumption engines, cold weather, and start-stop trips tend to accentuate this condition. The use of grill covers is helpful in winter, and if the engine has low oil consumption, the addition of about 1 pt of light cylinder oil to each 8 gal of fuel may correct the trouble.

b. Gasoline gum is caused by a combination of *old* gasoline and heat. This gum may appear without warning in the fuel pump, the carburetor, or on the valve stems. It can be identified by the ease with which it is dissolved with a solvent like lacquer thinner. If a vehicle is to be stored for a long period, all gasoline should be drained from the tank and the engine run to empty lines, pump, and carburetor, so that only fresh fuel will be in the system, when refilling.

c. Oil carbon deposits on the upper end of the exhaust valve stem and in the top of the guide frequently cause valve sticking. Engines of high oil consumption that are periodically operated at high temperatures because of hot weather or hard driving, are apt to have this trouble. Service reconditioning to reduce the excessive oil consumption and the avoidance of conditions that promote sludge formation are recommended by the committee.

National Meetings Handling Centralized; Bissell Manager

Mr. Bissell, who heads the new SAE Meetings Department, and Miss Ursula Delchamps, his assistant

THOMAS A. BISSELL has been named manager, SAE Meetings Department, John A. C. Warner, SAE Secretary and General Manager, announced last week.

Centralization of headquarters' staff responsibility for development and handling of all national meetings, Mr. Warner pointed out, will strengthen the effectiveness of National Meetings Committee functioning, aid in producing better balanced meetings for the Society as a whole and increase the efficiency of headquarters' staff operations.

Mr. Bissell will be staff contact for all Activity Committees in their development of meetings programs and will be responsible for the announcement and promotion of all national meetings, as well as for the operation of the meetings themselves. Aiding Mr. Bissell will be Ursula Delchamps, who becomes assistant to the Manager of the SAE Meetings Department.

Eight years ago, Mr. Bissell joined the SAE staff as technical editor of the *SAE Journal*, following extensive experience both in plant engineering and in technical publication work. He has read several papers before SAE audiences dealing chiefly with analyses of passenger car design trends, and more recently, with problems of materials substitution. One of the latter, "Designing for Alternate Materials," which appeared in the July, 1941, *SAE Journal*, received an Award of Merit in the annual competition sponsored by *Industrial Marketing* for the best published research work initiated by a business paper.

Mr. Bissell received his M. E. degree from Cornell. He served for several months last year as civilian consultant to the Production Manufacturing Operations Section, Branch, Bureau of Aeronautics, Navy Department, and since his return to the SAE staff has been staff representative for a number of

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TWEC Reports Need For Tractor Starters

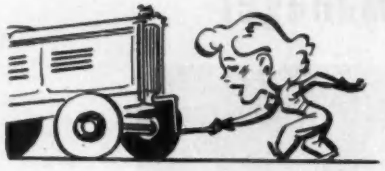
The starting motor and generator of the average tractor contain 7.68 lb of copper and brass, so that if the entire tractor production allowed by WPB for 1943 were equipped with starters and generators, only 272 tons of copper and brass would be needed, according to the SAE Tractor War Emergency Committee in a report recently prepared for the Farm Machinery & Equipment Division of WPB.

The demand for self-starters has increased tremendously in recent years. Only 54% of the 1940 tractors of one large producer, who sold self-starters as optional equipment, were provided with them, while 90% of his 1942 tractors had them.

This increase has probably been brought about by the difficulties of starting the modern high-compression engines used in tractors by available farm help. The war has intensified this problem, the report stresses, for now much larger numbers of women, children, and older men, who are not capable of cranking these large engines by hand, are being employed on farms, thus making it urgent that an easy means of starting be provided on all tractors in use today.

The report further points out that tractors

equipped with self-starters are more economical than those without starters. When the operator knows that he can readily re-



start the engine of a vehicle that is stopped to make adjustments or repairs, he can save fuel by shutting off the engine. Otherwise, the tendency is to idle the engine during these periods.

E. A. Petersen, Massey-Harris Co., was chairman of the subcommittee that drew up the report.

Engine Trouble

Low Octane Fuel Held Not Responsible For Mechanical Failures

DESPITE the lower octane number of gasoline currently being used along the Eastern Seaboard, the SAE War Engineering Board has concluded that the majority of motor vehicle engine trouble cannot be attributed directly to this cause.

Many car and truck dealers and operators of thousands of trucks in this area were questioned by a W.E.B. special group headed by J. M. Crawford, chief engineer of Chevrolet Motor Division, General Motors Corp.

Because of shortage of replacement parts on one hand, and more intensive use of trucks on the other, operators and manufacturers had expected serious maintenance difficulties for the duration. Conclusions of the Board include:

- Most mechanical failures are due to high mileage of vehicles, which increased normal wear. A serious shortage of service and maintenance mechanics is one of the contributing causes of mechanical failures;
- Most operators use whatever gasoline is available, and have become reconciled to lower octane grades;
- Ignition settings have been retarded in many vehicles to prevent excessive detonation. This has resulted in:
- Somewhat less economy of operation and poorer performance. Several operators of vehicles reported that slightly more time is required to cover delivery routes.

The relatively few mechanical failures reported were not directly attributable to low octane gasoline. These were:

- Valve failures, with loss of power. These failures occur when valve lash is set too close;
- Broken pistons, and
- Cracked cylinder heads.

To aid operators in overcoming mechanical failures, the Board recommends that these steps be taken when only low octane fuel is available:

- Retard the spark to conform to the gasoline being used. Although this will prevent excessive detonation, it may result in a slight loss of power, slightly less fuel economy, and higher operating temperatures for the engine;
- Set valves for greater lash. This will tend to reduce valve failures;
- Reduce the compression ratio in some engines. This will mean a slight loss in power;
- In some cases, the carburetor setting should be changed. Again, this will result in a slight power loss, and
- It may be advisable to clean out the carbon more frequently in some vehicles.

SAE Group Expedites Shot Peening Applications to Reduce Metal Stresses

Production Division of SAE General Standards Committee has organized a Subdivision on Shot Peening to expedite standardizing the application of shot peening as a cold-working process increasing the fatigue life of ferrous metals.

J. O. Almen, of Research Laboratories Division, General Motors Corp., has been appointed chairman of the subdivision, which already has held preliminary meetings with users and manufacturers of shot, and shot-peening equipment, and has initiated a test program designed to aid in standardizing:

- Grades, sizes, tolerances, and identification of shot.
- Methods of application.
- Tests and measurements of results.

The test program involves the cooperation of shot manufacturers in supplying users with test samples, and of shot-peening-equipment manufacturers in developing approved methods of application. It is proposed, upon completion of the test program, to prepare complete recommendations upon which standards of materials, application, and results may be based.

The shot-peening process stems from theories that all surfaces, as discontinuities of material, are stress raisers, and that all fatigue failures being tensile failures, surface peening puts metal near the surface in a compressive state as opposed to the state of tension caused by grinding. It is believed that by applying to the finishing of machine parts a modernized technique of metal-beating known anciently to makers of weapons and more recently to fabricators of buggy springs, the fatigue life of machine parts can be increased within the range of 200% to 1500%. The test program is designed to overcome such difficulties as lack of uniformity in the sizes, quality, and physical characteristics of shot, in shot-peening equipment and methods of use, and in measuring results comparatively.

Members of the new subdivision include:

L. L. Andrus, American Foundry Equipment Co., Mishawaka, Ind.; C. A. Bultman, Panghorn Corp., Detroit, Mich.; M. Z. Delp, Studebaker Corp., South Bend, Ind.; Paul McConnell, Globe Steel Abrasive Co., Mansfield, Ohio; A. V. Mathey, Wright Aeronautical Corp., Paterson, N. J.; R. L. Mattson, General Motors Research Laboratories, Detroit; E. A. Milke, Harrison Abrasive Corp., Manchester, N. H.; H. J. Noble, Jacobs Aircraft Engine Co., Pottstown, Pa.; S. S. Parsons, Parsons Engineering Corp., Cleveland, Ohio; and A. E. Proctor, Ford Motor Co., Dearborn, Mich.

Also W. L. R. Steele, Eaton Mfg. Co.,

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Important Announcement Regarding SAE Transactions

To SAE Members:

Government restrictions regarding the use of paper have made it necessary for the SAE Council to suspend publication of the SAE Transactions in their bound form, for the duration, starting with Volume 51—1943. This action was taken so that the SAE Journal could continue to carry its full amount of technical information as in the past and thus be available to all members of the Society.

As you know, the bound volumes of SAE Transactions are duplications of the technical material that has already appeared in the SAE Journal each month.

It is the Council's intention, when conditions permit, that the missing issues of SAE Transactions may be published in suitable form so that those of you who wish to complete your bound sets will have the opportunity to do so.

We know that you will understand the necessity of this wartime action.

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

John A. C. Warner

Secretary and General Manager.

SAE NOMINEES FOR 1944

President.....W. S. James
Chief Engineer,
Studebaker Corp.

Treasurer .....David Beecroft
Bendix Products Division,
Bendix Aviation Corp.

Membership on SAE Council

Term of 1944-1945:

L. R. Buckendale
Vice-President, Charge Engineering, Timken-Detroit Axle Co.

R. F. Steeneck
District Manager, Fafnir Bearing Co.

H. T. Youngren
Chief Engineer, Oldsmobile Division, General Motors Corp.

To serve for one year, to fill the unexpired 1943-1944 term of J. C. Zeder, resigned:

Arthur Nutt
Vice-President of Engineering, Wright Aeronautical Corp.

CONTINUING on the Council for 1944 will be the following men who were elected for a two-year term at the beginning of 1943: N. P. PETERSEN, President, Canadian Acme Screw & Gear, Ltd.; and C. G. A. ROSEN, Director of Research, Caterpillar Tractor Co. Serving on the 1944 Council as Past-Presidents will be MAC SHORT, Vice-President, Engineering, Vega Aircraft Corp.; and A. W. HERRINGTON, Chairman, Board of Directors, Marmon-Herrington Co., Inc.

Vice-Presidents:

Aircraft .....R. D. Kelly
Superintendent, Development, United Air Lines Transport Corp.

Aircraft-Engine .....A. T. Gregory
Chief Engineer, Ranger Aircraft Engines

Diesel-Engine .....A. J. Blackwood
Fuel Research Engineer, Standard Oil Development Co.

Fuels & Lubricants.....J. R. Sabina
Manager, Petroleum Chemicals Testing Laboratory, E. I. du Pont de Nemours & Co.

Passenger-Car .....E. H. Smith
Executive Engineer, Aircraft Engine Division, Packard Motor Car Co.

Passenger-Car-Body.....E. C. DeSmet
Chief Engineer, Aircraft Division, Willys-Overland Motors, Inc.

Production .....J. E. Hacker
Production Manager, Cleveland Diesel Engine Division, General Motors Corp.

Tractor & Farm Machinery
O. R. Schoenrock
Chief Engineer, J. I. Case Co.

Transportation & Maintenance
E. W. Templin
Automotive Engineer, Los Angeles Bureau of Power & Light

Truck & Bus .....E. M. Schultheis
Detroit Representative, Clark Equipment Co.

SAE NATIONAL FUELS & LUBRICANTS Meeting

Nov. 4-5

Mayo Hotel Tulsa

THURSDAY, Nov. 4

MORNING

Carl A. Tangner, Chairman

The Operation of Engines under Emergency Conditions
– Warren G. Brown, Caterpillar Tractor Co.

AFTERNOON

T. B. Rendel, Chairman

An Instrument for Recording Blowby Gases in an Internal Combustion Engine
– R. R. Proctor, A. J. Stock and D. J. Wangelin, Mechanical Laboratory, Pure Oil Co.

Oil Foaming
– R. J. S. Pigott and H. A. Ambrose Gulf Research & Development Co.

EVENING

W. M. Holaday, Chairman

On the SAE Battlefronts
– Mac Short, President, SAE
John A. C. Warner, Secretary and General Manager, SAE

FRIDAY, Nov. 5

MORNING

H. L. Moir, Chairman

Application of Engine Oil Preservatives
– A. P. Ayers, Pratt & Whitney Aircraft

New Method of Evaluating Ring Sticking of Aircraft Oils
– L. W. Griffith and M. E. Schramm, Engine Research Laboratory, Shell Oil Co.

AFTERNOON

C. B. Veal, Chairman

Report of the CLR-Cooperative Universal Engine Test Group
– John R. Griffin, Shell Development Co.

General Discussion: Aviation Fuels and Post-War Requirements
– Led by R. C. Alden, Phillips Petroleum Co.

EVENING

R. J. S. Pigott, Chairman

Military Ground Forces – Fuels and Lubrication Problems
– Major James A. Richardson, III, Ordnance Department

Shot-Peening Program

continued from page 22

Detroit; R. E. Van Deventer, Packard Motor Car Co., Detroit; F. P. Zimmerli, Barnes-Gibson-Raymond Division, Associated Spring Corp., Detroit; H. H. ZurBurg, Chrysler Corp., I. M. Olsen and G. S. Porter, Industrial Metal Abrasives Co., Jackson, Mich.; O. J. Gartner, Steelblast Abrasive Co., Cleveland; J. A. Raleigh, Cleveland Metal Abrasive Co., Howell, Mich.; and J. A. Comstock, Pratt & Whitney Aircraft, East Hartford, Conn.

Specs Revised for Rubber Conservation

SAE standards for rubber engine mounts, and brake and coolant hoses, are being revised by subcommittees of joint SAE-ASTM Technical Committee A on Automotive Rubber to bring them into accord with new wartime SAE classifications and specifications for reclaimed, synthetic, and natural rubber compounds.

Objective is to circumvent the shortage of natural rubber by facilitating development of satisfactory reclaimed and synthetic rubber substitutes.

Standards for rubber engine mounts and brake hoses already have been approved by Technical Committee A, as have two new reports, one on specifications for reclaimed rubber coolant hoses for combat vehicles, the other on synthetic rubber coolant hoses for non-combat vehicles.

The work is bringing up to date the 57 SAE-ASTM standards and specifications for synthetic, 40 SAE-ASTM standards and specifications for natural, rubber compounds which two years ago introduced order into the chaos of hundreds of available materials with resulting conservation and wider use of materials, manufacturing speed-up.

Reports indicate the committees are approaching satisfactory solution of the problem of providing suitable substitutes for unavailable natural rubber for v-belts and other drives which meet the service requirements of both combat and transport vehicles. SAE subcommittees are aiding the Ordnance Department with field tests of substitute belts and hoses satisfactory for use on military motor vehicles throughout the extreme temperature range of global warfare.

Data in Pamphlet Form

As soon as supplemental data to the specifications are completed, they will be published in pamphlet form as an advance supplement of the 1944 "SAE Handbook." All specifications for test procedures and methods conform with ASTM standards.

W. J. McCortney, Chrysler Corp., is chairman of Technical Committee A, and J. H. Doering, Ford Motor Co., is vice-chairman.

Chairmen of subcommittees include:

Subcommittee 1 on Engine Mounts, J. F. McWhorter, Ohio Rubber Co.; Subcommittee 2 on Bumpers, E. J. Kvet, Baldwin Rubber Co.; Subcommittee 3 on Hoses, M. J. De France, Goodyear Tire and Rubber Co.; Subcommittee 4 on Rubber Compounds, Mr. Doering; Subcommittee 6 on V-Belts, A. J. Kearfott, General Motors Research Laboratories; Subcommittee 7 on Hardness Testing, L. V. Cooper, Firestone Tire and Rubber Co.

War Transportation Problems Analyzed at West Coast T&M Meeting

continued from page 19

It won't come till we finish the present job, but we are looking forward for proper procedure when the day comes. That phase is being properly considered," he said.

Ray Kelly, United Air Lines Transport Corp., chairman of the national Membership Committee, said membership is rapidly approaching the 10,000-mark, not including student members. It is up 19% over a year ago July 31.

Urges Simplicity in Cargo Planes

Friday afternoon, when Members "took to the air," J. B. Kendrick, Vega Aircraft Corp., presented a paper, "Air Cargo Planes from the Engineering Viewpoint." He said an extra pound of airplane weight-empty will amount to $100 to $200 profit lost to the operator over the normal life of a cargo plane.

"Great improvements are needed in airplanes to simplify the accessibility of critical parts for inspection and maintenance. Slight increases in weight may be involved but such compromises are usually beneficial to the overall utility of the airplane.

"More attention must be paid to balance and load distribution on the cargo plane than is generally needed on a land vehicle."

Sees Vast Cargo Gains

Thomas Wolfe, Western Air Lines, discussed "Post-War Commercial Aviation," and estimated that out of 577 billion ton-miles of the pre-Pearl Harbor utility type of intercity traffic flowing annually in the United States, the air lines stand a reasonable chance to capture four billion ton-miles during the 10 years following the war. This is less than 1% of the total. However, it means an overall increase of about 40 times air transport's past normal performance.

Mr. Wolfe's surface transport audience got a big lift when he revealed that the average air express package travel for a 1075-mile haul is "something like" a basic cruising speed of the airplane, 187 mph; including schedule speed of the plane, 137 mph; including terminal, handling and servicing, 127 mph; and including pickup and delivery overall time, 63 mph.

Conclusions expressed by Mr. Wolfe were:

A vast amount of new traffic awaits the development and expansion of aviation;

Engineering talent should be directed to further reduction in costs and improved operation methods;

All forms of ground transport can relax from fear of air competition and improve their own methods; and

Discussion of the Kendrick and Wolfe papers developed the opinions that engineering is the big problem ahead, improved ground service is essential, schedule reliability must be improved, total airplane traffic today would not fill five railroad trains, about one-third of the value of the airplane is in practical service today, terminals are too far from cities, percentage of payload must be increased.

The dinner meeting Friday evening, consisting of six discussions, brought the technical sessions to a close. Prof. W. H. Paul, of Oregon State College, was chairman.

Fred E. Barth, National Motor Bearing Co., said in his discussion of "Oil Seals" that they are a vital but much neglected part of automotive work. "We have to keep the wheels running in spite of all the difficulties," he said.

In telling about "Vehicle Maintenance from the Standpoint of an Oil Man," D. N. Harris, Shell Oil Co., said early attention to minor service requirements will avoid major repairs. He made the statement that gasoline standards in octane number today are practically the same as before the war.

F. W. Kavanagh, Standard Oil Co. of Calif., speaking on "Current Trends in Lubrication," said that changes go on continually and everyone puts new development needs up to the petroleum industry. Each lubricant is a development resulting from use. Compounding oils have become much more common.

This is the era of substitution, according to what R. A. Watson, Federal-Mogul Corp., told the audience when discussing "Bearings." "Most bearing materials are on the critical list so the industry has had to substitute, with results that are not too bad. New metals meet with satisfactory performance when proper installation has been made. If there are tin base bearings in an engine it probably was designed for those bearings and use of a different type will probably cause trouble.

Speaking on "Metal Spraying," E. V. Berry, Precision Engineering Co., said that 100 lb of wire used in a month was unusual in his company's plants 10 years ago. Today, the company atomizes about 16,000 lb a month. He said the inner surface of a brake drum can be sprayed successfully. Aluminum and cast iron must be degreased before spraying.

The new Castolin Eutetic process of welding was described by G. A. MacGillivray, who said it originated in Switzerland about 25 years ago and has been in use in this country for less than three years.

Steer Joint Aircraft Hydraulic System Meeting

Head table group of a four-day joint session of the National Aircraft Standards Subcommittee on Hydraulic Systems, and the SAE Committee A-6 on Aircraft Hydraulic Equipment, Aug. 10-13 in Chicago. They met with Army, Navy, and industry hydraulics engineers to outline new projects. Eight standards and recommendations were completed to be submitted to the Army and Navy, and an extensive program was undertaken at the request of Government representatives. Only a few of the 93 engineers are shown. L. to R.: E. W. Norris, NASC and Aeronautical Chamber of Commerce of America; B. R. Teree, NASC and Curtiss-Wright Corp.; J. D. Redding, SAE staff; Mrs. Gladys Shumate, secretary of the joint meeting; Harry P. Kupiec, Glenn L. Martin Co. and chairman of the meeting, chairman of the NASC subcommittee and a member of SAE A-6; Harold W. Adams, Douglas Aircraft Co. and chairman of SAE Committee A-6; Lt.-Com. H. J. Marx, USNR; E. A. Volk, Jr., Air Associates, Inc.; Nicholas Bashark, AAF Materiel Command; Howard Field, North American Aviation, Inc., a member of both SAE A-6 and the NASC; and Lt. Gordon Davisson and Lt. Donald L. Drum, both AAF and staff members of the Working Committee of the Army-Navy Aeronautical Board. Representatives of 16 Army, Navy, and other Government agencies were present, as well as Ernest Jones, British Air Commission

Technical IDEAS

AIRWORTHINESS

Speculations On Future Regulations

by EDWARD WARNER
Civil Aeronautics Board

■ **Metropolitan, Sept. 9**

(Excerpts from paper entitled "Speculations on Airworthiness and Operating Regulations.")

MY own concept of the proper scope of future equipment regulation is that it should be framed:

- To prevent the manufacture and sale of aircraft presenting an inherent and inevitable hazard;
- To insure that the purchasers of aircraft will receive adequate and accurate information on characteristics important to safety, and
- To require, in cases especially pertinent to the public interest, that the conditions under which equipment is used should be so related to the equipment's characteristics as to maintain proper margins of safety.

And I would add the general overriding precept:

"When in doubt between two courses, choose the less restrictive."

Advantages and drawbacks of increased flexibility can best be examined in terms of specific cases. The non-transport type, whether for private or commercial use, must now be analyzed for the ability to sustain a 30-ft vertical gust at maximum design level speed (VL). This is now flexible, because VL can be chosen at the manufacturer's discretion, providing the aircraft is placarded against exceeding the chosen figure in level flight.

There appears to be universal agreement that some flexibility is desirable in the requirements for maneuvering factors. American airworthiness requirements have long held to uniform standards; two or more specified categories are established elsewhere. Many private owners will be quite content with an ultimate maneuvering factor of 5, but a graduate of Fighter Command may want a machine certified for a factor of 12.

I suggest that manufacturers be permitted to make their own decisions about the degree of acrobatic capacity for which there will be substantial demand, subject to a minimum; and that private purchasers be left to make up their own minds and pick a model with appropriate strength.

Certain minimum stability and control factors should remain, but they ought to be supplemented by additional information on the characteristics of the individual airplane. I suggest that the obligation to supply a manual should apply to all types of aircraft, and that checking major items of its contents should be a part of the routine of every test for type certificate.

We have abandoned any maximum limit on take-off distance for transports. Its retention for non-transport types is an anomoly.

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Lubricating Oils And Lubricants

by A. W. BURWELL
Alox Corp.

■ **Mid-Continent, May 7**

(Excerpts from paper entitled "Boundary Film Lubrication.")

WITH the advent of higher speeds and the output of higher powers from smaller and smaller engines it became apparent to many people in the field of lubrication that the use of so-called additives was becoming not only desirable but in many cases necessary. During the past 12 years a considerable business has been built up in the use of various materials for this purpose. In many cases it has seldom been necessary to add to properly stable and otherwise good lubricating oils more than from 1% to 1½% of such materials. In other cases, as little as 0.1% or even as little as 0.05% is sufficient for particular uses.

It was found that by the addition of very minute quantities of new synthetic fats to commercial petroleum lubricating oils, bearing metals were protected against rapid wear which was then rather common with straight mineral oils, and that corrosion of the surfaces of bearing systems practically disappeared. While at that time (1928) the question of corrosive wear of bearing surfaces was not considered to be of serious import, it has more recently become so, so that today it is considered by many engi-

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Briefed from Papers G

• Diesel Oil & Lube Filter Developments

by C. A. WINSLOW
Winslow Engineering Co.

■ **Northern California, June 8**

(Excerpts from paper entitled "Modern Filter Development as Applied to Fuel and Lube Oil Systems of Diesel Engines.")

THE primary function of fuel filters is to prevent grit, abrasives, gum, varnish, and other impurities from passing from the fuel oil supply to the delicate and closely-fitted working surfaces of the injection pump and still more delicate parts of the fuel nozzles. Because the fuel filter must be a one-pass filter, it is essential that the porosity through the filter be of such a nature that the minimum dangerous particle size will not pass through under the maximum velocity and pressure which can be developed by the fuel supply pump. An ideal hook-up for a fuel filter would be one where only the fuel actually used by the engine passes the filter. In this case, only the minimum amount of oil required by the engine would be passed through the filter, thus reducing the volume and velocity of the fuel oil to be filtered.

The best precaution that any diesel-engine operator can take to insure continuous operation with clean fuel is to provide adequate settling space before the fuel is delivered to the vehicle or vessel and to insure positive filtration through adequately large filters at

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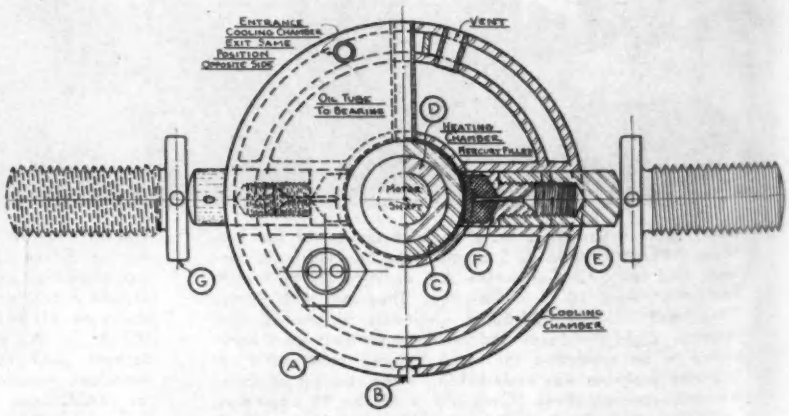

Diagram of bearing parts of Lubarometer

A Housing *B* Counterweight Needle Bearing *C* Journal *D* Tapered Collar *E* Bearing Plug *F* Bearing Metal *G* Pressure Screw

ENGINEERS

★ ★

at SAE SECTION MEETINGS

Stress Strain
How Theory Is Used In Making Parts

by F. C. HOFFMAN
Lockheed Aircraft Corp.

■ Southern California, June 11

(Excerpts from paper entitled "Practical Application of Stress Strain Theory in Fabrication of Aircraft Parts.")

THE foremost problem in aircraft production is one of proper design and rapid production of sheet metal forming tools, A full understanding of forming properties of various aircraft materials, the limits of each method of forming, and die design and construction are of vital importance to every tool designer and planner. The problems of production, particularly forming problems, will be greatly simplified by the use of this same knowledge in the design of sheet metal parts.

Materials are commonly judged by their yield strength, ultimate strength, and elongation in 2 in. While these properties are usually sufficient to judge the structural value of a material, they do not necessarily give enough information to judge the forming characteristics and to analyze typical forming operations. Of much more value is the stress-strain curve.

The range between the yield point and the ultimate is termed "plastic range"; it is obvious that forming must be done within these limits. It is necessary, though, to bear in mind that elastic recovery does exist throughout this range and causes serious difficulties in springback, even though it is only of a magnitude of 0.004 in. per in.

A test coupon, held between grips that are about 5 in. apart, has been used to determine maximum elongation and its distribution in 2 in. The specimen is machined down to 0.5 in. in width by 2 in. in length in the center portion. On this area is photographed a fine grid of lines 0.01 in. apart. Elongation studies are made from these specimens after failure occurs, and the results are plotted on a graph. In the area directly adjacent to the fracture, the material stretches approximately 40%, but over the 2-in. length, the average is only 18%. This average is the one usually referred to in handbooks. The high local elongation that occurs near the fracture explains why it is possible to bend 24S-T to a much smaller radius than could ordinarily be expected. The progressive bending around such a small radius takes advantage of these high local characteristics.

A number of charts have recently been

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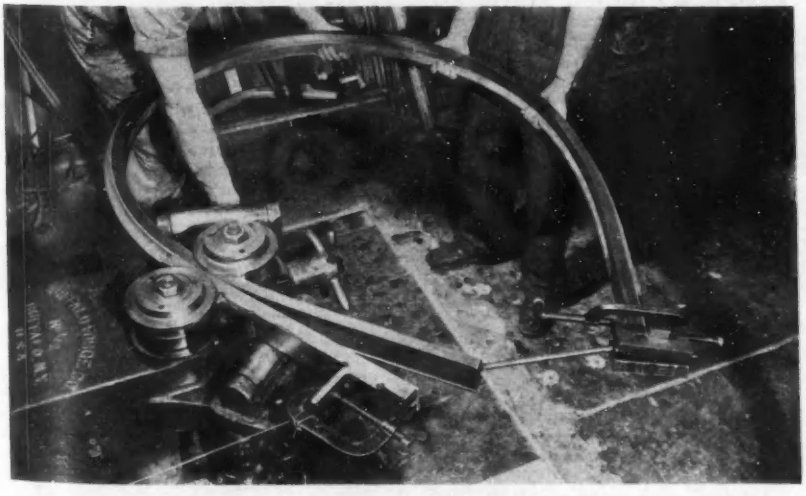

Fig. 1 – A "T" extrusion being shaped to an irregular contour in one pass through a bar-forming machine

• Tools and Operations Planning for Aircraft

by WALTER BRAINARD
Consolidated Vultee Aircraft Corp.

■ Southern California, June 11

(Excerpts from paper entitled "Tool and Operations Planning.")

THE aircraft tool and operation planner, supplied with the blueprints of the complete airplane, its major assemblies and component parts, is responsible for the issuance of detailed written instructions for its manufacture.

These instructions, termed "planning," are supplied for each of the thousands of fabricated parts, and for each assembly operation, beginning with the withdrawal of sheet metal, bar stock, and other raw materials from the storerooms, to the flying away of the finished product.

Every tool that is designed, built, and inspected, is in accordance with the planner's detailed description. Every operation performed by the workman is in accordance with, and in the sequence established by, the planning.

Equal in importance to the function of planning new assemblies and new parts, is the responsibility of changing planning, and reworking or making new tools as product, method, or materials are changed.

When planning a new airplane, it must be determined whether the proposed schedule can be met by a single tooling program, or whether it will be necessary to provide an additional set of simple tooling for initial production.

Such a determination is made by the use of approximate tool-cost factors based upon past experience. Thus, total tooling hours required may be compared with daily tooling hours available, and the fairly accurate tool completion schedule thus derived may be compared to the initial production schedule of the proposed airplane.

Also, a general assembly plan must be decided upon. The final assembly of the airplane is definitely a conveyor job. Many of the major assemblies are also adaptable to conveyor line assembly, arranged to feed into the main line at the proper attaching stations. Consideration should be given, to

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Consolidated Vultee photo

End-point of tool and operations planning is smooth runoff at the end of the production line

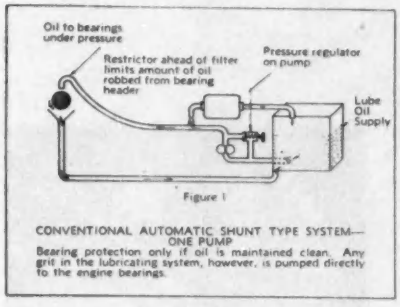

Figure 1

CONVENTIONAL AUTOMATIC SHUNT TYPE SYSTEM—ONE PUMP

Bearing protection only if oil is maintained clean. Any grit in the lubricating system, however, is pumped directly to the engine bearings.

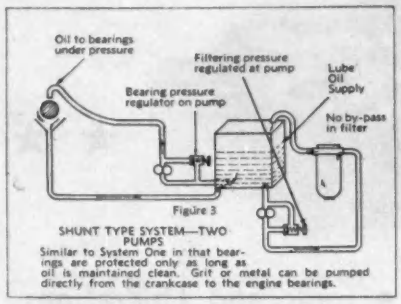

Figure 3

SHUNT TYPE SYSTEM—TWO PUMPS

Similar to System One in that bearings are protected only as long as oil is maintained clean. Grit or metal can be pumped directly from the crankcase to the engine bearings.

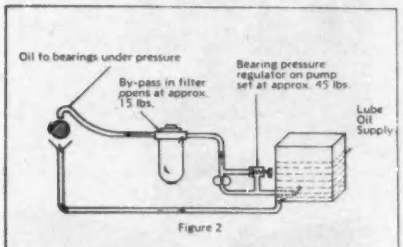

Figure 2

FULL-FLOW, IN-LINE SYSTEM—ONE PUMP

Simplicity of design with maximum bearing protection providing adequately large filtering area is provided.

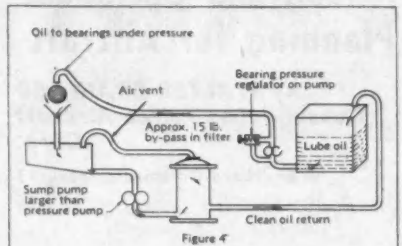

Figure 4

DRY SUMP SYSTEM—TWO PUMPS

Maximum bearing protection and recommended for all large installations.

Diesel Oil and Lube Filter Developments

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the time that the fuel is delivered from the storage to the vehicle or vessel tanks.

Regarding diesel lubricating oil filters I might quote from a recent publication entitled "Lubrication," printed by The Texas Co.: "Precision bearings and the caps and saddle bores into which they fit are machined to very close tolerances. With bearing linings 0.002 to 0.005 in. thick and with journal to bearing clearances 0.0015 to 0.0035, a matter of a few thousandths of an inch becomes important. The life of the bearing in service will depend on how well these clearances can be maintained. Thus, during fitting or bearing replacement, misalignment on the order of 0.0005 to 0.0010 or reductions in clearance of the same magnitude may be serious.

"Dirt is perhaps the greatest enemy of bearings. Engine manufacturers install oil filters and air filters to keep dirt out of engines because they realize that the life of engines can be materially increased if dirt is kept out."

Since there are so many various types of lubricating systems to which filters are attached or of which filters are a part, we might consider the accompanying schematic illustrations, all of which are applied with variations to diesel engines.

Fig. 1 is a simple shunt-type filter installation wherein the filter simply steals a certain amount of oil from the gage line, filters it and discharges back to the lube oil supply. This is the conventional system used on most automobile and vehicle engines which are not designed to receive a filter as a built-in part of the lubricating system.

Fig. 2 is a full-flow in-line system wherein the filter is connected directly between the pump and the engine bearings. A bypass is provided in the filter to insure that oil will be supplied regardless of the condition of the filter element.

Fig. 3 illustrates a conventional pressure system wherein the primary pump forces the pressure against the engine bearings with the bypass discharging back to the oil supply. The oil filter is operated by a separate pump in which the pressure regulator from the intake to the discharge limits the maximum pressure against the oil filter element. No bypass is required on the filter in this case, as it simply stops when the elements are completely clogged up, and has nothing to do with the delivery of oil to the engine bearings.

Fig. 4 is a modification of Fig. 3, except that it is generally applied to dry-sump engines, the similarity being that two pumps are required, one to insure the pressure against the engine bearings and the second, which scavenges the crankcase, to force the oil – hot and dirty – from the sump, through the filter to the oil supply tank.

Tools and Operation Planning for Aircraft

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the type of operations required to create the assembly. As a rule it is not practicable to build up a basic riveted structure by conveyor line.

It next becomes advisable to make what is termed a "breakdown" of each major assembly into such subassemblies as may be desirable. One of the principal factors establishing the number of subassemblies involved is the method of attaining the necessary holes for the attaching rivets. Hole patterns for mating parts must match exactly, as otherwise the rivet cannot be inserted.

Matching hole patterns for mating parts may be established by:

1. Drilling or piercing through both parts simultaneously while they are clamped into position, or

2. Drilling or piercing each part separately, depending upon coordination of hole patterns.

An analysis of the various methods, based upon operation labor hours only, will show an approximate comparative ratio as follows:

Automatic rivet – 1 hr per 1000 rivets.

Drill and rivet in assembly – 2 hr per 1000 rivets.

Drill in detail, and rivet in assembly – 2½ hr per 1000 rivets.

The comparison of drill and rivet in assembly, and drill in detail riveting in assembly, should be thoroughly examined.

The planner, in making his breakdown, must carefully consider the fabricating method that will be used for each of the detail parts. He should endeavor to create such subassemblies as are applicable to automatic riveting.

Other subassembly groupings will depend upon design arrangement, and upon how the holes for rivets are to be attained. Following a tentative breakdown, the planner prepares a detailed planning for each assembly.

The discussion of detailed planning will be confined to sheet metal aluminum alloy parts.

Must Forecast Costs and Rejections

The planner should be provided with sufficient data to enable a reasonably accurate forecast of tool cost, operation cost, material scrap cost, and rejection probability.

The first operation usually performed in fabricating a detail sheet metal part is that of shearing on a powered square shear. The planner arranges the most economical layout, that is, the one developing the least scrap, which directs the stock room as to the size of sheet to be issued, and the shear operator as to the operation sequence.

While square shearing is nearly always less expensive than blanking, there are occasions where the normal set-up inaccuracies from shearing cannot be allowed, and blanking must be resorted to.

The best method for forming, bending, or drawing is not so easily arrived at. Here, accuracy requirements, heat-treat distortion, and other factors usually isolate the problem to one or two methods that will produce acceptable parts.

To accomplish the planning of new products, and changes in existing ones, the functions have been divided into:

Assembly planning, detail planning, process planning and clerical.

There is an assembly planner, or group, assigned to each project. There is a detail planning group for each manufacturing department fabricating detail parts.

The process planning group handles all projects. It is their function to determine how, when, and where to wash, clean, plate, and paint parts.

Upon receipt of the engineering drawing, a planning folder containing the print is assigned a job number, and dispatched to the lead assembly planner concerned.

Upon completion of assembly planning, which includes certain hole and locating requirements information for the detail planner, the folder is routed to the detail planning group concerned.

The detail planner completes his portion of the work, and sends the job folder to process planning. From process the job advances to clerical, where ditto masters are typed, tool orders are written, and ditto copies of the planning dispatched to files located throughout the plant, including manufacturing departments.

As the job advances through the planning department, until the master goes to production, return vouchers to the dispatcher provide a posting of all progress. This allows a daily determination of loading on all groups, and eliminates bottlenecks by allowing some personnel transfers in order to keep all groups loaded approximately equally.

SAE Vehicle Maintenance Committees Report Techniques to Army and ODT

Review of Projects of Scores of Groups Shows How Fleet Operating Engineers Serve Ordnance Officers and Civilian Owners, Although Problems Differ

U. S. ARMY, owner and operator of the largest motor vehicle fleet ever assembled, and Office of Defense Transportation, which holds the fate of irreplaceable civilian motor vehicles, are utilizing the practical knowledge of automotive maintenance engineers to keep 'em rolling.

Both Army and ODT have established vehicular longevity as a major objective and have recognized preventive maintenance as the direct route to that goal. Since only an infinitesimal proportion of civilian motor vehicles can be replaced for the duration, ODT's efforts at vehicular preservation are obvious. However, the interest of the Army, which can get all the vehicles it wants, in preserving transport and combat equipment which at the best has minimum life-expectancy, may seem strange to those who have regarded automotive rolling stock as temporary items to be replaced as soon as possible by newer models.

Underlying these phenomena are the wartime economy of scarcity and a new appreciation of motor vehicle service life. Highway transportation has established itself as an essential wartime operation. The Army has taken to heart the lessons of mechanized warfare: a vehicle in the field is worth two in the factory; the value of any vehicle is fixed by its availability for service.

Army and ODT are profiting by motor vehicle maintenance advice and knowledge distilled from the experience of commercial motor vehicle operators under the direction of SAE Transportation and Maintenance War Advisory Committee. The work of this group developed from conversion of the peacetime Transportation and Maintenance Activity of the Society of Automotive Engineers to war objectives. Recommended practices for the conservation of civilian motor vehicles are being developed by the SAE-ODT Maintenance Methods Coordinating Committee. A similar job is being done for the Army by the SAE Ordnance Vehicle Maintenance Committee. Both committees have organized various subcommittees and groups to which research and development projects are assigned.

These undertakings are pertinent to the nation's war program, but their results inevitably will transcend war service. Already it is patent that they are the foundations of standardized techniques of automotive maintenance engineering which effectively will supplement American progress in automotive design and production engineering. In effect, vehicle maintenance is a nation-wide proving ground affording well-authenticated reports by trained technical observers.

Twenty years ago automotive manufacturers alone possessed technical knowledge of vehicle maintenance. Between wars a huge motor vehicle maintenance operation grew to industrial proportions in servicing the products of the automotive manufacturing plants. Some maintenance engineers are now responsible for the continuing operation of more vehicles than a sizable truck-manufacturing plant produces in a whole year.

These maintenance engineers make no pretense to knowledge of automotive design and production engineering. It is their job to keep those motor vehicles rolling economically under a wide variety of conditions and circumstances. Of necessity they have developed encyclopedic knowledge of how to do that particular job.

It so happens that mechanized war has put premiums on their knowledge and techniques, which are now being dedicated to:

- Conservation of military motorized equipment,
- Conservation of essential civilian automotive equipment,
- Perpetuating highway transportation service in wartime, and
- Standardizing automotive maintenance technique.

Fleet maintenance engineers handle about one-third of the commercial motor vehicles in the United States. Through dissemination by ODT, the maintenance data they are developing are reaching the individual owners and operators of the other two-thirds. It is a big job of maintenance evangelism, and its aim is to make practically effective the wartime conservation of vehicles, parts, and manpower.

Knowledge that, given a break in the way of proper maintenance, an American motor vehicle will roll up an astounding mileage underlies the interest of the Army. The Army's attitude further reflects its conviction that in mobile, mechanized warfare, the gun-carriage is as essential as the weapon.

The Army wants the utmost in service, availability, and reliability from its more than 300,000 pieces of automotive equipment. It regards as a bargain the price it must pay in maintenance and inspection procedure. That price really is a bargain from the standpoint either of economics or military tactics. Trading an hour of maintenance for a day otherwise lost to repairs means more vehicles available for service more of the time, Army appropriations available for purposes other than replacement, and war plants devoting more machines, materials, and hours to the production of other necessities.

Army Turns to SAE

Sold on the idea that maintenance does it, the Army turned to fleet maintenance engineers as experts in the service field when on Dec. 2, 1942, the SAE Ordnance Ve-

T&M-ARMY CONTACT

Col. George W. Vaughn, Chief, Maintenance Branch, Tank-Automotive Center, Detroit, has been appointed the Ordnance Department's contact with the SAE Ordnance Vehicle Maintenance Committee, headed by Don K. Wilson, New York Power & Light Corp. Recently returned from China, where he was adviser to the Chinese Government, the colonel was first commissioned in the Field Artillery upon his graduation from the U. S. Military Academy

hicle Maintenance Committee was organized at the request of Maj.-Gen. L. H. Campbell, Jr. Col. G. W. Vaughn is the contact officer for this group. For instance, the Army now is utilizing the services of the Front-Wheel Bearing Lubrication and Adjustment Group of the Lubrication of Ordnance Vehicles Committee of the SAE Ordnance Vehicle Maintenance Committee to develop standard practices for lubricating and adjusting front-wheel bearings on Army vehicles.

In contrast with global war, this little job has all the earmarks of insignificance. It happens to be important. Deciding exactly how much lubricant is sufficient to protect front-wheel bearings without packing in so much grease that the forward brakes become useless can save upwards of eight Army manhours per vehicle now devoted to an avoidable repetitive job.

The members of the OVMC group are maintenance men responsible for the operation of a total of 45,000 commercial motor vehicles. Once they have this special problem licked, they will be invited to eliminate some other service "bugs" troubling the Army.

Vehicle Preservation Project

Another OVMC group has completed recommended practices for preparation and preservation of Ordnance vehicles for storage after use. This job developed from Army effort to have plenty of combat and transport vehicles parked in convenient motor pools, and the sad discovery that the vehicles were subject to alarmingly rapid deterioration. It is the Army's objective to make all vehicles in all motor pools available for duty at all times. It is the OVMC group's job to suggest the maintenance practices which will produce the desired result.

Headed for extensive research is an OVMC job for the Army, calling for reclamation of vehicle parts, particularly brake drums, axle shafts, and engine valves. This work, entrusted to three OVMC groups, is another case of developing maintenance techniques to meet the exigencies of wartime economy and to supplement established Army procedures. Until now, it has been customary to replace worn brake drums, broken axle shafts, and worn valves. The old parts were consigned to the junk heap. That idea might have been practical when bins were full, but wartime parts would have changed the situation even if the Army's insistence upon conservation were less compelling.

Fortunately, fleet maintenance engineers already had developed anti-junking techniques satisfactory for commercial operations. Worn brake drums were metal-sprayed. Broken axle shafts were welded and new seats puddled on worn valves. The current research represents an effort to work out the engineering principles for these successful rule-of-thumb repair methods, and to disseminate the data for general use.

Standards of Maintenance

The motorized American Army scarcely was rolling before it encountered the obviously difficult task of setting up standards of maintenance and of measurement of wear useful as a basis of determining whether a motor vehicle is in satisfactory condition for overseas service. Ordnance requirements provide that 75% of the potential mileage remain in a vehicle fitted for overseas service, but do not indicate at what point an Army vehicle becomes 25% decrepit.

Shipping space, spares, and parts are scarce, and even should war yield time for repairs overseas, the Army cannot gamble on any vehicle. Motorized armies in mechanized war operate on the "gotta go" principle. Anything, mechanical or human, which does not go, automatically becomes a casualty.

The problem obviously calls for establishing standard references to be used as "go" or "no go" gages by an Army inspector who may have to pass or reject a motor vehicle which he has never before seen or handled. Lack of time precludes extensive internal probing, or even searching the vehicle's biography for symptoms which might reveal unfitness for foreign service.

OVMC committees have submitted to the Ordnance Department a report on proposed "Standards of Wear and Maintenance for Vehicles to be Shipped Overseas" as one contribution to the solution of this difficult inspection problem.

Out of this same American Army "gotta go" theory has developed still another job—proper maintenance of cooling systems in military motor vehicles. In this case the OVMC group is authorized to recommend any kind of servicing which involves no major design changes, and which includes use and re-use of anti-freeze preparations. Since Army vehicles operate under many atmospheric and climatic conditions, and in circumstances which demand that the equipment function—or else, it is expected that more, and more complete, information on cooling systems and their maintenance now will be developed than ever before has been available.

As the world's largest motor vehicle fleet operator the Army naturally has a tremendous service personnel problem. The Army is developing standardized systems of personnel-training designed to produce skilled mechanics and service men in the minimum of time.

Practical engineering and service contributions toward the conservation of commercial and civilian motor vehicles have been made by the SAE Transportation and Maintenance War Advisory Committee and its groups on even a larger scale than its work for the Army. Twelve of 30 original assignments in the service field already have been completed. Others are nearing completion. A few have been postponed for the duration.

Knowledge Pooled for ODT

Like the Army, ODT benefits by the pooling of the knowledge and experience of maintenance engineers. Reports and recommendations prepared by the joint SAE-ODT Coordinating Committee are published and distributed by ODT through W. J. Cumming, Chief of the Maintenance Section of the Office of Defense Transportation, as contact with this committee. One of the more popular of these—its circulation already exceeding 40,000 copies—is a comprehensive treatise on preventive maintenance and inspection procedure, revealing what to do and when it should be done to obtain the maximum reliable service from each vehicle at minimum cost.

The report recognized wartime scarcities of mechanics, materials, parts, and time, as well as the widely varying and sometimes discouraging conditions under which vehicles now operate. It presents simple tables alphabetically listing nine types of vehicles, including cars, trucks, and buses; six service functions; five service periods measured by mileage; and 15 groups of vehicle parts which require routine servicing. The presentation is sufficiently flexible to permit of varying the mileage intervals to satisfy changes in vehicle design or in operation. It is sufficiently general to cover every type of vehicle, yet is adequately specific in describing the nature and extent of services and inspections.

For instance, the tables reveal that passenger car axle and wheel alignment, Item A-2, calls for "B" maintenance service—a visual check-up—at 1000 to 2000 miles on passenger cars, 500 to 2000 miles on heavy trucks in start-and-stop operations. At 4000 to 5000 miles this item calls for "H" service—physical inspection and repair. At 60,000 to 100,000 miles, "R" service—replacement, rebuilding, or reconditioning—is indicated.

Hand brake controls, Item H-2, are shown to need "T" service, or tests, daily, and at 1000 to 2000 miles to require "OTL" service—oiling, testing, and inspection. By reference to the tables any vehicle operator can ascertain exactly what service is needed daily or at any mileage intervals.

Current plan is to develop information covering those operations more frequently and generally needed to keep commercial and civilian vehicles in essential service under wartime conditions. With experienced mechanics called into military service or taking jobs in war plants, the satisfactory fitting and installation of engine bearings, for example, becomes difficult. The average mechanic learned this technique by years of practice, but in few instances was his technique recorded. Now, however, the basic information appears in "Replacement Technique for Installation or Fitting of Engine Bearings," prepared by an SAE-T & M subcommittee, published by the Government printer, and distributed by ODT. This illustrated report fully describes bearing types and materials, presents an operational guide for bearing replacement, supplies the technical knowledge essential to maintenance, servicing, and replacement of bearings.

Cooling Systems Studied

The value of this growing literature of vehicle maintenance and servicing cannot be overestimated, either for wartime or peacetime. It is probable that not within their combined lifetimes could 100 service mechanics assimilate all the technical knowledge contained in a 45-page report on cleansing and flushing, preventing rust, and using anti-freeze solutions on cooling systems. Maintenance of cooling systems is a routine, but important service. Until now the efficiency of that service was dependent largely upon the skill and experience of the individual mechanic. Now any mechanic who can read can learn what to do and how to do it.

This new treatise, based upon practical and widespread operating experience, presents all the pertinent facts involved, from the importance of adequate cooling, through inspection and testing for cooling liquid losses, routine maintenance, diagnosis of overheating or overcooling difficulties, and ways and means of preventing corrosion and clogging, to the characteristics and uses of the different types of anti-freeze preparations.

Similarly comprehensive and helpful are reports and recommendations for reconditioning brake drums, and for reconditioning cast-in-block engines by installing cylinder

sleeves. These particular reports enable vehicle operators anywhere in the United States to recondition these wearing parts and to keep their vehicles rolling.

Vehicles Protected in War "Freeze"

The ramifications of the work are vast. For instance, when the sale of new motor vehicles was halted and stocks were frozen on salesroom floors, RFC sensed the threat of deterioration in the vehicular security for Government funds. RFC put to OPA and ODT the problem of protecting both vehicles and investment. The job was passed on to an SAE Committee on Storing Vehicles and Preparing Vehicles for Service After Storage. This group rapidly prepared and submitted a report and recommendations which gave all the Government agencies concerned complete and practical information on how to preserve the idle vehicles.

Further helpful information, never before so completely published, has been assembled in a report on cold welding. This technique, for years known as "mechanical lacing" and variously regarded by operators inclined to put more faith in replacements than in repairs, has found growing acceptance as replacement parts became increasingly scarce, then unobtainable. Further, the report lifted the veil of secrecy surrounding a technique which, inherently simple, is no more mysterious than the dental operation of filling a cavity, which in many respects it resembles.

Reports Widely Distributed

Widespread distribution of this cold welding report by ODT makes it possible permanently to repair 95% of the gasoline, diesel, steam, and other engines rendered inoperative by breaks and cracks in cylinder walls, heads, valve seats and chambers, exhaust ports, crankcases, and other parts, whether due to freezing, stress and strain, or other causes. The report describes and illustrates in detail the cold-welding procedure for many common types of repairs, and, as a Government publication, is generally available.

Other reports and recommendations cover mechanic training, fitting pistons to reconditioned cylinders, technique of fitting under-size engine bearings, applications and techniques of hard-surfacing, standard practice instructions, training of mechanics, steering maintenance, care and repair of batteries, and storing vehicles and preparing vehicles for service after storage. Under consideration or in preparation are reports on tire maintenance and retreads, static charges and remedies, use of expander-type piston rings, brake drum reconditioning, plain bushings to replace ball or roller bearings, engine temperature control, and driver training.

These helpful data are fed from SAE to ODT, and by ODT into many diverse channels of distribution. They reach maintenance engineers in charge of truck fleets, and they reach individual operators. They become part of the equipment of service establishments.

All these reports are concerned directly and only with maintenance. Typical is the report on care and repair of storage batteries, which comprises a set of straightforward, streamlined, practical instructions for the actual care of the batteries. Typical also is the report on cooling system maintenance. It is concerned with protecting the parts

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TRANSPORTATION & MAINTENANCE WAR ADVISORY COMMITTEE

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A. M. WOLF

* As Chief, Vehicle Maintenance Section, Division of Motor Transport, Office of Defense Transportation, Mr. Cumming is also official SAE contact with the ODT.

About SAE

Heads International Nickel's Development and Research Division

■

Appointment of **T. H. WICKENDEN** as manager of the Development and Research Division of the International Nickel Co. was recently announced by the president of the company. Mr. Wickenden, who has been assistant manager of the Division since 1931, was in charge of engineering at Studebaker Corp.'s South Bend plant from 1913 to 1920.

DR. CHARLES F. KETTERING is chairman of the new advisory committee on the development of the Technological Institute of Northwestern University, Evanston, Ill. The purpose of the committee will be to counsel with the University on matters relating to the future educational and research programs of the Institute in the fields of science and engineering.

FRANCIS P. O'CONNELL is a lieutenant (jg) in the U. S. Navy. He had been an inspector of ordnance material in the U. S. Army, Detroit Ordnance District.

J. C. SANDERS has been transferred from Langley Field, Hampton, Va., to the Cleveland Airport, where he is research engineer for National Advisory Committee for Aeronautics.

N. H. DANIEL, past-chairman of the Canadian Section, may be reached c/o General Motors, Ltd., Argyll House, 246-250 Regent St., London W.1, England. He was previously service engineer for the same company in Canada.

WILFRED G. BURGAN, who had been chief engineer, U. S. Army, Office of Chief of Ordnance, Tank-Combat Vehicle Division, Arlington, Va., is now at the Tank-Automotive Center in Detroit as deputy director of transport vehicles.

RICHARD J. KOERWER has been advanced from engineering trainee to test engineer, Wright Aeronautical Corp., Paterson, N. J.

CLAYTON FARRIS, a former chairman of Metropolitan Section and president, The Trucktor Corp., Newark, N. J., has been appointed a member of the Attachment Third Axle Industry Advisory Committee of the War Production Board, John E. Graham, deputy director, Automotive Division, War Production Board, announced.

President **ROBERT J. MINSHALL** announced that effective Oct. 1, the name of Pump Engineering Corp., Cleveland, was changed to PESCO Products Co. This change has no effect on present personnel or on the company's affiliation with Borg-Warner Corp., the parent company. Mr. Minshall is also president of McCulloch Engineering Corp., Milwaukee, according to a recent announcement made by **ROBERT McCULLOCH,** who resigned this position to undertake a new development in the war effort.

Robert J. Minshall

WALTER S. FORTNEY has been promoted to first lieutenant in the U. S. Army. Lt. Fortney, who is an engineering officer with an air force service squadron in North Africa, was with United Motors Service in Dallas, Tex., before enlisting in the Army.

STANLEY PAUL CLURMAN, Curtiss Propeller Division, Curtiss-Wright Corp., Caldwell, N. J., has been transferred from experimental test engineer to experimental design engineer.

Having recently completed a course in economics at the British Staff Officers' School, **MAJOR J. RUSSELL WALSH** may now be reached at Headquarters, European Theater of Operations, Civil Affairs Section, A.P.O. 887, c/o Postmaster, New York.

LT.-COL. FELIX DORAN, JR., has been transferred from the Tank-Automotive Center, Detroit, to Rock Island Arsenal, Davenport, Iowa, as assistant to the supply officer in charge of field service section. In civilian life Col. Doran was general manager of the fleet division of General Motors Corp.

JOHN R. BOND, formerly with Studebaker Corp., South Bend., Ind., is now design engineer for Aerojet Engineering Corp., Pasadena, Calif.

WILLIAM K. RITTER, senior mechanical engineer, National Advisory Committee for Aeronautics, has been transferred from Langley Field, Hampton, Va., to the Municipal Airport, Cleveland.

Temporarily detached from the Lincoln Motor Division, Ford Motor Co., Detroit, **H. J. ROBINSON** is now superintendent, director division of Ford in Dearborn, Mich.

FREDERICK L. BRASH, private first class, has been transferred from 361st Engineers Regiment, Company C, Camp Claiborne, La., to the 1305th Engineers Regiment, H & S Company, Camp Sutton, N. C.

J. J. MURRAY, formerly president, Aircraft Holding Corp., Culver City, Calif., is now head motion picture studio technician, Army Signal Corps Photographic Center, Beverly Hills, Calif.

Among the members of the Industry Advisory Committee for the Commercial Motor Vehicle Manufacturing Industry appointed by the Office of Price Administration to advise on pricing problems are **JOSEPH P. LITTLE,** vice-president, Yellow Truck & Coach Division, General Motors Corp., and **JOHN N. BAUMAN,** vice-president, White Motor Co. The committee will cooperate with OPA in studies of proposed amendments to ceiling prices under Supplementary Regulation 14.

R. G. MESCHINO P/O enlisted in the Royal Canadian Air Force several months ago and at present is technical adjutant of No. 9 Bombing & Gunnery School, Mont Joli, Que. In civilian life he had been tool engineer for National Steel Car, Ltd., Aircraft Division, Malton, Ont., Canada.

Members

ROBERT H. CLARK, general superintendent of transportation, Consolidated Edison Co. of N. Y., has been appointed general superintendent of outside plant construction for the system's companies: New York & Queens Electric Light & Power Co., Brooklyn Edison Co., and Consolidated Edison Co. of N. Y. Mr. Clark, who has been active in Metropolitan Section work for the past several years, is vice-chairman of the Section.

JACK IRWIN HAMILTON'S position in the Propeller Division of the Curtiss-Wright Corp., Caldwell, N. J., has been changed from administrative engineer to assistant to manager of military programs.

EDWARD GRAY has been promoted from major to lieutenant colonel. Col. Gray is inspection control officer in the Automotive Division, Proving Center, Aberdeen Proving Ground, Md.

Formerly assistant resident representative, U. S. Army Air Forces, c/o Allison Division, General Motors Corp., Indianapolis, **JOHN KENNETH HAMPTON** is now a major. He is stationed in Memphis, Tenn., where he is area procurement officer.

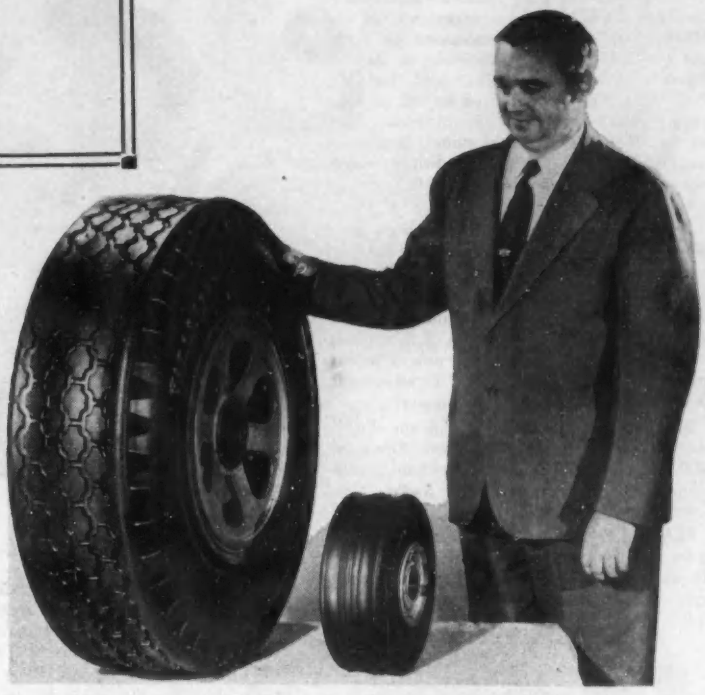
Following his graduation from Oregon State College, **A. LEE FOSTER** joined the staff of the engineering department of Alaska Division of Pan American Airways.

ROY L. QUEEN is assistant test engineer for the Aerojet Engineering Corp., Pasadena, Calif. He was formerly associate engineer in charge of engine test, U. S. Army Air Forces, Materiel Division, Central District Office, Detroit.

E. H. ROSSELL has finished his training at the RCAF School of Aeronautical Engineering, Montreal, and is now a pilot officer.

J. C. LONDELIUS, chief powerplant engineer for Douglas Aircraft Co., Inc., in Africa, is now with the Hindustan Aircraft Co., Ltd., in India. He can be reached through A.P.O. 886, c/o Postmaster, New York.

J. C. Londelius



For his development of a new channel tread airplane tire described by aviation authorities as an outstanding contribution to the war effort and adopted by the Army and Navy Air Forces, Eugene A. Roberts, research engineer of Firestone Tire & Rubber Co., was given the Citation for Production Ideas, highest honor bestowed by the WPB's Board of Individual Awards. Mr. Roberts' device has made possible the standardization of this type of tire and has increased by five to tenfold its life under extreme loads and landing conditions

E. N. LAURANCE has been named acting works manager of the Miami Division, Consolidated Vultee Aircraft Corp. After having spent a year with Spartan Aircraft Co., where he was factory superintendent, Mr. Laurance joined Intercontinent Aircraft Corp. in 1942, as superintendent of fabrication. At the time of his resignation, he had been factory manager for that company.

Formerly assistant engineering officer, Syracuse Army Air Base, **1ST LT. NILE E. FAUST** may now be reached at the Air Service Command, 433rd Sub-Depot, Otis Field, Falmouth, Mass., where he is officer in charge of the Maintenance Division.

Lt. Nile E. Faust

Lt. (jg) WILLIAM G. BURT, JR., USNR, is stationed at the Brooklyn (N. Y.) Navy Yard. Lt. Burt is assistant radio superintendent.

Formerly head instructor in skilled automotive trades, U. S. Army Ordnance Motor Transport Training School, Fort Sheridan, Ill., **DANIEL E. HAMILTON** is now automotive adviser to base ordnance officer at Selfridge Field, Mich.

REX M. A. FERMIER is inspection supervisor, U. S. Army, War Department, Ammunition Section, Chicago Ordnance District. He was formerly key inspector for the M54-55 Ordnance Fuse Industry Integrating Committee, U. S. Army Ordnance Department, Scoville Mfg. Co., Waterbury, Conn.

D. D. ALTON is no longer special engineer for Southern Pacific Lines, Houston, Tex., having been promoted to the position of assistant superintendent, motive power and equipment, for Southern Pacific Lines in Texas and Louisiana.

Promotion of **W. J. KINGS** from junior to senior engineer for The Buda Co., Harvey, Ill., recently took place.

MELVIN LLOYD VANCIEL, formerly in the U. S. Army Air Forces at Cuero, Tex., is now a second lieutenant in the 26th Reconnaissance Squadron, Salinas, Calif. Lt. Vanciel is a pilot and pilot observer.

Culmination of more than two years of work, **D. CAMERON PECK** opened "Yesterday's Main Street" at the Museum of Science & Industry, Chicago, recently. Mr. Peck, who is a director and secretary of

the Bowman Dairy Co., possesses a large and valuable collection of historic automobiles and has contributed his experience to the Museum as curator of transportation without remuneration. "Yesterday's Main Street" serves as a background for Mr. Peck's cars and is sponsored by six of Chicago's pioneer business organizations. The street is paved with cobblestones, lit by gas lamps, decorated with an old-time watering trough and shows the 1910 scene in authentic detail.

EUGENE S. MACHLIN has been promoted from junior mechanical engineer to assistant mechanical engineer of the National Advisory Committee for Aeronautics.

A. H. BATCHELDER, formerly division superintendent, Richmond Laboratories Standard Oil Co. of Calif., is now assistant manager in the Research & Development Department, of the same company.

Formerly ignition engineer in the Engineering Department of Allison Division, **NOEL J. LITUCHY** is now mechanical development engineer, Collins Radio Co., Cedar Rapids, Iowa.

SAMUEL NOOGER is chief technical director for Aero Manuscripts, Inc., New York. He was formerly associate mechanical engineer, AAF, Material Command, Wright Field.

J. P. Bourne

J. P. BOURNE has moved from the Portland to the San Francisco branch of Standard Oil Co. of Calif., where he is superintendent, industrial lubricating sales.

WILLIAM A. M. BURDEN has been named special aviation assistant to the Secretary of Commerce, Washington, D. C. He was previously vice-president, Defense Supplies Corp., Division American Republics Aviation, Washington.

LT. ROBERT L. BACON, formerly development engineer, International Harvester Co., Inc., Fort Wayne, Ind., is now a maintenance engineer in the U. S. Army Air Forces.

Formerly assistant chief engineer of the Societé des Moteurs Gnome & Rhone, Paris, France, **ROBERT BEAUVAIS** has joined the Matam Corp. of Long Island City, N. Y., as director of research.

WILLIAM ARMSTRONG has been promoted from chief engineer to vice-president in charge of engineering, Hub Industries, Inc., Long Island City, N. Y.

R. R. TEMPLETON, formerly field engineer, Wright Aero, Ltd., Los Angeles, is now field engineering division staff engineer for Wright Aeronautical Corp., Paterson, N. J.

W. H. Richardson

The Timken Roller Bearing Co., Canton, Ohio, recently announced the appointment of **W. H. RICHARDSON** as general manager of activities of all divisions of The Timken Roller Bearing Co. on the West Coast and in the Orient. He is to be in charge in that territory for the sale and merchandising of roller bearings for original equipment in railroad cars and locomotives, automobiles and trucks, and all types of industrial machinery, as well as the sale and merchandising of bearings for replacement purposes. He will also supervise sales of Timken Steel and Tubing and Timken Rock Bits. Mr. Richardson plans to make his headquarters in San Francisco.

OLEG J. DEVORN, who had been stress engineer, Vega Aircraft Corp., Burbank, Calif., has joined Vought-Sikorsky Aircraft Division, United Aircraft Corp., Stratford, Conn., as structural engineer.

DR. C. M. LARSON and W. C. Schwaderer of the Sinclair Refining Co., have devised a set of four Viscosity Classification Charts to facilitate the task of making an intelligent selection of oils on a viscosity basis by eliminating cumbersome computations, interpolations, conversions, and alignment charts. These new charts show at a glance the following data:

1. Viscosity index – ASTM (D567-41) and corresponding values at 130 F.
2. Kinematic and Saybolt Universal viscosities – conversion scales based on and amplified from ASTM standard method for conversion of kinematic viscosity to Saybolt Universal viscosity (D446-39).
3. SAE numbers – viscosity crankcase oil classification.
4. Automotive manufacturers' viscosity classification.
5. SAE numbers – viscosity transmission and axle lubricant classification.
6. Viscosity-temperature relationships at O F, 100 F, 130 F, and 210 F for crankcase oils and gear lubricants.

Dr. Larson and Mr. Schwaderer have also invented a Viscosity Blending and Dilution Chart, which furnishes a more convenient means for estimating the approximate viscosity of a mixture of petroleum liquids when the viscosities of the components, at one and the same temperature, are known.

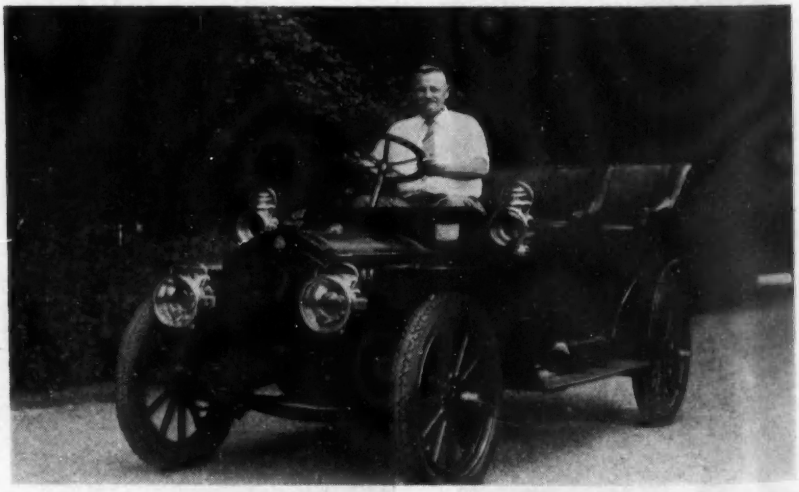
Further information about these charts can be obtained from the Sinclair Refining Co., 630 Fifth Ave., New York City, 20.

BERNARD I. SATHER has recently been transferred from Langley Field, Hampton, Va., to the Cleveland Airport, where he is associate mechanical engineer for the National Advisory Committee for Aeronautics.

HENRY G. FALLERIUS, superintendent of transportation, has been transferred from the Cleveland to the Chicago office of the City Ice & Fuel Co.

Formerly with the General Petroleum Corp., Los Angeles, **J. J. MILLER** is now connected with the Pennzoil Co., same city.

SAE Past-Councilor Dean Fales Writes . . .



"The winter of rideless Sundays let me rebuild a 1908 de Dion from a junkyard wreck to a snappy little rig that will be my official car for Veteran Car Meets after the war. It will do a snappy 35 mph and has fine vision and ventilation."

EDWARD G. GRINHAM is chief technical executive for Humber, Ltd., Coventry, England.

MARTIN BERLYN has been promoted from chief engineer, Diesel Engineering Department, to manager and chief engineer, Diesel Division, Dominion Engineering Works, Ltd., Montreal.

CONSTANTINE A. MICHALOS, formerly a student at N. Y. U., is now assistant project engineer at Wright Field.

EDWIN C. BROWN has been promoted from assistant to chief engineer of production, Western Austin Co., Aurora, Ill.

Formerly a design draftsman in the Houde Engineering Division of Houdaille-Hershey Corp., **GEORGE J. FARRELL** is now draftsman and group leader for the same company.

CAPT. ALBERT W. JORDAN, formerly Officer's Division, Antiaircraft School, Camp Davis, N. C., can now be reached at A.P.O. 7019, c/o Postmaster, New York.

J. I. HAMILTON has been appointed assistant to **R. ELMER MINTON,** manager of military programs for the Curtiss-Wright Corp., Propeller Division, Caldwell, N. J. Mr. Hamilton joined the Caldwell staff in 1938.

ROY B. GRAY, formerly with the Department of Agriculture, is now with the Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville Research Center, Beltsville, Md.

TAGE HANSEN, formerly with the Colonial Beacon Oil Co., Everett, Mass. is now a private first class at the Air Corps Technical School, Gulfport, Miss.

SAE members serving on the new Automotive, Farm & Tractor Liquid-Cooled Gasoline Engine Industry Advisory Committee of the War Production Board are: **IRVING B. BABCOCK,** president and general manager, Yellow Truck & Coach Mfg. Co.; **B. B. BACHMAN,** vice-president, Autocar Co.; **ANSEL N. MORTON,** factory manager, International-Plainfield Motor Co.; and **W. F. CASPER,** chairman and president, Fairmont Railway Motors, Inc. Other members are P. V. Moulder, International Harvester Co.; Courtney Johnson, Studebaker Corp.; A. W. Picket, Willys-Overland Motors, Inc.; and William A. Roberts, Allis-Chalmers Mfg. Co. SAE member **R. L. VANIMAN,** director of the WPB Automotive Division, is Government presiding officer.

MILLER McCLINTOCK, president, Mutual Broadcasting System, Inc., has been appointed a member of the Office of War Information Advisory Radio & Policy Committee, Elmer Davis, director, and Palmer Hoyt, head of OWI domestic operations, announced.

How automotive engineering executives participated in the War Manpower Commission's campaign to balance manpower needs in Dayton and Springfield, Ohio, is reported by the Office of War Information, showing in detail the project which was contributed to by four SAE members. Among the members of Dayton's War Manpower Commission's labor-management advisory committee was **ARTHUR R. FORS,** vice-president of Airtemp Corp., under the chairmanship of Dr. F. G. Barr, National Cash Register Co. **WILLIAM CONRAD JORDAN,** general manager of Steel Products Engineering Co., was a member of a similar committee in Springfield, headed by John H. Horstman, Robbins & Myers, Inc. SAE members **COL. EDWARD A. DEEDS,**

Raydelle Josephson
Research Associate in Physics
California Institute of Technology

Isabel Ebel
Engineer
United Air Lines Transport Corp.

Eleanor Allen
Technical Editor
SAE Journal

Women Members of SAE

We present the distaff side of the Society, which is contributing its share to the country's engineering achievements

Lidia Manson
Research Engineer
Clark Bros., Inc.

Doris E. Weir
Assistant Director of Research
Evans Engineering Co.

Mary Lee Marquis
Engineer
Aircraft & Marine Department
General Electric Co.

Lucile H. Sergeant
Junior Engineer
Wright Aeronautical Corp.

SAE Meeting

MATERIALS...

War and Post-War

Nov. 10

Hotel Carter, Cleveland

This one-day national meeting – arranged by the SAE Passenger-Car Activity and the SAE Truck and Bus Activity with the cooperation of the Cleveland Section – will be crammed with timely subjects of great interest.

The Speakers . . .

A. T. Colwell, Thompson Products, Inc.
P. M. Torrance, Firestone Tire & Rubber Co.
Dr. D. S. Frederick and W. F. Bartoe, Rohm & Haas Co.

The Subjects . . .

- Effect of Wartime Fuel Development on Post-War Passenger Cars
- Recent Progress in Synthetic Rubbers
- Characteristics of Plastics as Engineering Materials

DINNER
Speaker To Be Announced

Committee in charge of meeting:

Robert Cass, Chairman
Harry F. Gray, Cleveland Section
E. W. Allen, Truck and Bus Activity
R. E. Cole, Passenger-Car Activity

chairman of National Cash Register Co., and **CHARLES F. KETTERING,** past-president of SAE and vice-president of General Motors Corp., served on the Emergency Committee headed by S. C. Allyn, president of National Cash Register Co. This group discussed the problem in detail with more than 200 manufacturers in the Dayton-Springfield area, with the result that impending labor shortages, due to migration of workers, absenteeism, and misfitting of workers, were solved. The report is Office of War Information Release 2334, and is available From Washington or local WMC offices.

Formerly aircraft process engineer, Donnelly Engineering Co., Detroit, **DALE L. COSPER** is now wing group lead supervisor, TBY-1, in the Allentown (Pa.) Division of Consolidated Vultee Aircraft Corp.

RICHARD E. CREDE has joined The Fostoria Screw Co., Fostoria, Ohio. Mr. Crede's former position was that of tool engineer with the Weatherhead Co., Cleveland.

ALBERT R. CROCKER, who had been development engineer, Engineering & Research Corp., Riverdale, Md., is now assistant chief engineer in the Propeller Division of the same company.

JOHN S. TAWRESEY has been commissioned a major in the U. S. Army Air Forces, and after a period of duty at Miami Beach is now stationed at Wright Field, Dayton. He has been associated with SKF Industries, Inc., for the past 22 years, and as assistant chief engineer has been active in both the aircraft and automobile field.

Recent promotions among members in the armed services include: **HAROLD A. NISLEY,** Ordnance Officer, Armored Force, headquarters Armored Force, Fort Knox, Ky., from lieutenant-colonel to colonel; **MILLARD FILLMORE PERRY,** Army Air Forces, Materiel Center, Wright Field, Dayton, Ohio, to first lieutenant: **HAROLD N. BROWNSON,** from Captain to major, Tank-Automotive center, Ordnance Department, Detroit; **LLOYD E. ARNOLD,** Army Air Forces, foreign service, from major to colonel; **JOHN R. BIRD,** Ordnance Department, Arlington, Va., from captain to major; and **FRANK E. BLACK,** from captain, 71st Coast Artillery, Washington, to major, 45th AAA Group, Ft. Sheridan, Ill.

Cleveland Chairman

Harry F. Gray, president and chief engineer of International Piston Ring Co., is chairman of the SAE Cleveland Section for the 1943-44 year. (In the September *SAE Journal* the picture on p. 30 under which Mr. Gray's name appeared was not Mr. Gray.)

LT.-COM. E. H. FENN, A-V(S), USNR, may be reached c/o Commander U. S. Naval Aircraft, Southwest Pacific Force, Fleet Post Office, San Francisco. He was formerly with the Commonwealth Aircraft Corp., Pty., Ltd., Lidscombe, New South Wales, Australia.

Formerly mechanical engineer, Springfield Machine & Foundry Co., Springfield, Mass., **GEORGE W. BAIERLEIN** is now chief designer, Hub Industries, Inc., Stamford, Conn.

BERTIN A. BISBEE has been promoted from assistant general superintendent to superintendent, Greenpoint Works, Brooklyn Union Gas Co., Brooklyn, N. Y.

JOHN J. GRABFIELD, who had been liaison engineer and mechanic for the Eastern Aircraft Division of General Motors Corp., Linden, N. J., is now layout man on the installation of powerplant in the Mars flying boat being built by the Otis Elevator Co.

HARLEY W. DRAKE announced recently that the name Renton-Bothell-Seattle Stage Line, Inc., of which he is general manager, has been changed to Lake Shore Lines, Inc.

SPENCER D. BROWN, formerly assistant factory manager, Harris Products Co., Cleveland, is a private first class in the U. S. Army. He is stationed at the Army Air Base, Camp Campbell, Ky.

Appointment of **E. C. WOOD** as chief of transportation service and transportation officer for the San Francisco Civilian War Council was announced by Major Angelo J. Rossi. Major Wood is division superintendent of transportation for the Pacific Gas & Electric Co., San Francisco. He will assist the Council in coordinating fleets of vehicles in case of emergency.

RUDOLPH ANGER, formerly an aircraft instructor at the George Washington High School, Los Angeles, is now a master

mechanic Hughes Aircraft Co., Culver City, Calif.

PETER F. ROSSMANN has been transferred from the Buffalo to the Bloomfield, N. J. branch of Curtiss-Wright Corp., where he has been made general manager. Mr. Rossmann had been chief of the Developments Department in Buffalo.

WALTER H. BEECH has been named chairman of the board of Beech Aircraft Corp., Wichita, Kan., of which he is also president.

JOHN D. BALDWIN, JR., formerly an engineer for the Weatherhead Co., Los Angeles, has been made manager of the Glendale (Calif.) branch of the company.

OBITUARIES

Harry C. Tillotson

Harry C. Tillotson, founder and president of the Tillotson Mfg. Co., producers of carburetors, died Sept. 1. The Tillotson carburetor was one of the first workable carburetors developed in the United States. He started developing it while selling automobiles and bicycles in Chicago, and opened a factory in Toledo for its manufacture in 1914. The carburetors were soon being used in Willys-Overland, Willys-Knight and Chrysler cars. During the first World War he converted his plant to the making of trench mortar fuses. Mr. Tillotson joined the SAE in 1912.

M. W. McConkey

M. W. McConkey, president of the Hydraulic Brake Co., died July 17. He was a graduate of George Washington University, class of 1920. Mr. McConkey was at one time patent lawyer for the Bendix Corp., Chicago, and General Motors in Detroit.

George W. Crist

George W. Crist, who developed and promoted the steel-backed bearing now being used universally by manufacturers of internal-combustion engines, died Aug. 26 at the age of 59, after a short illness. Mr. Crist had been resident engineer for the Cleveland Graphite Bronze Co. since 1926. Born in Rochester, N. Y., Mr. Crist came to Detroit in 1906 and received his early engineering training with the old Ypsilanti Machine Works and D.Y.A.A. and J. electric line in the company shops. In 1910 he went with E.M.F., which later became the Studebaker Corp., and continued with them for 14 years. Later he joined General Motors in an engineering capacity and stayed with them until joining Cleveland Graphite.

A. C. Hoof

A. C. Hoof, president of Hoof Products Co., died Aug. 8 at his home in Hinsdale, Ill., at the age of 55. Vice-president and later president of the John C. Hoof Co., founded in 1909 by his father, Mr. Hoof was one of the pioneers in the automotive parts and accessories field. In 1932 Mr. Hoof organized the Hoof Products Co., manufacturing engine governors. A few years ago he developed several new items for aircraft hyraulic systems.

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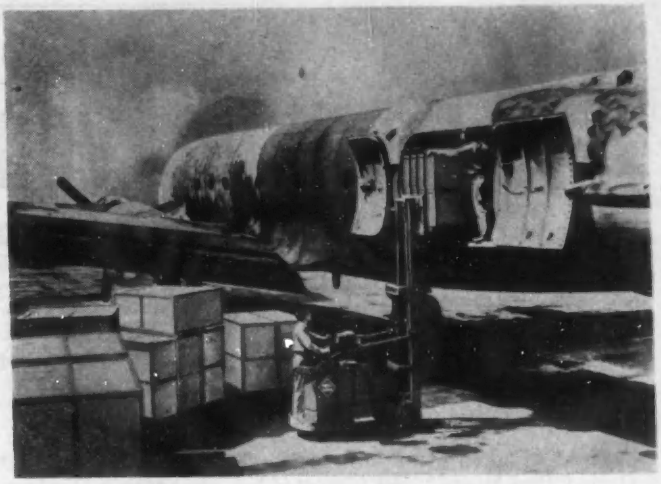

AIR CARGO MEETING

Knickerbocker Hotel, Chicago **Nov. 8-9**

MONDAY, NOV. 8

MORNING—Design Session

Design of Cargo Airplane Doors, Hatches, Floors and Related Equipment.
Economic Conversion of Military Aircraft to Transport Cargo Planes.

AFTERNOON—Economic Session

Economic Aspects of Short-Haul Airplanes, Including Glider Systems and Pickup Systems.
Coordinating Air and Surface Cargo Transportation.

EVENING—Operation Session

Air Freighter Specialties Operation.
Speed versus Payload for Cargo Transport.

TUESDAY, NOV. 9

MORNING—Airplane Cargo Handling Session

Air Cargo Handling Problems.

AFTERNOON—Packaging and Ground Handling Session

Saving in Ground Time in Pickup and Delivery Methods.
Standard Packaging and Methods for Air Cargo.

DINNER

Speakers to be announced.

Under Auspices of Chicago Section with cooperation of National Aircraft Activity

SAE Coming Events

Nov. 4-5

SAE National Fuels and Lubricants Meeting, Mayo Hotel – Tulsa

Nov. 10

SAE Meeting on Materials – War and Post-War, Hotel Carter – Cleveland. Sponsored by SAE Truck and Bus Activity and SAE Passenger-Car Activity with cooperation of Cleveland Section

Jan. 10-14, 1944

SAE Annual Meeting and Engineering Display, Book-Cadillac Hotel – Detroit

Chicago – Oct. 12

Knickerbocker Hotel; dinner 6:30 p.m. Transportation and Maintenance – Lt.-Col. H. O. Mathews, Tank-Automotive Center, Detroit.

Chicago – Nov. 8-9

Air Cargo meeting. With cooperation of National Aircraft Activity.

Cleveland – Oct. 4

Cleveland Club; dinner 6:00 p.m. Electronics in Industry – C. T. Madsen, electronics engineer, Westinghouse Electric & Manufacturing Co.

Detroit – Oct. 18

Horace H. Rackham Educational Memorial Bldg.; dinner 6:30 p.m. Gear Design Problems – Prof. Earle Buckingham, Massachusetts Institute of Technology.

Indiana – Oct. 14

Antlers Hotel, Indianapolis; dinner 6:45 p.m. The Split Engine and Increased Fuel Economy – E. O. Wirth, chief engineer, and A. H. Winkler, research engineer; Military and Light Aircraft Carburetors, Bendix Products Division, Bendix Aviation Corp. Paper to be presented by Mr. Winkler.

Kansas City – Nov. 5

Continental Hotel; dinner 6:30 p.m. Speaker: Mac Short, vice-president, engineering, Vega Aircraft Corp., and president, SAE. Guest: John A. C. Warner, secretary and general manager, SAE.

Metropolitan – Oct. 7

Georgian Room, Pennsylvania Hotel, New York; meeting 8:00 p.m. Symposium on Future Cars – F. F. Kishline, chief engineer, Nash Motors Division, Nash-Kelvinator Corp.

Milwaukee – Oct. 1

Milwaukee Athletic Club; dinner 6:30 p.m. Speaker to be announced.

Muskegon Club – Oct. 7

Substitute Steels – T. M. Snyder, chief metallurgist, Muskegon Plant, Continental Motors Corp.

Northern California – Oct. 12

Engineers Club, San Francisco; dinner 7:00 p.m. A Discussion of Post-War Motor Gasoline Characteristics – Grant Wheeler, research engineer, Tide Water Associated Oil Co.

Philadelphia – Oct. 13

Engineers Club; dinner 7:00 p.m. Fuels – T. H. Risk, assistant director, Refinery Division, Ethyl Corp.

Pittsburgh – Oct. 26

Webster Hall; dinner 6:30 p.m. Meeting at Mellon Institute; 8:00 p.m. Wartime Replacement Parts – Robert Cass, chief engineer, White Motor Co.

St. Louis – Oct. 12

Forest Park Hotel; dinner 6:30 p.m. Speaker to be announced. Movie film – The End of the Beginning – conversion of manufacturing plants to war production.

Southern California – Oct. 5 and 22

Oct. 5 – San Diego. Speaker: William B. Stout, director of research, Stout Research Division, Consolidated Aircraft Corp.

Oct. 22 – Clark Hotel, Los Angeles. Subject: Transportation and Maintenance. Speaker to be announced.

Southern Ohio – Oct. 11

Hotel Van Cleve, Dayton; dinner 6:15 p.m. Plastics – The Materials of the Future – Dr. Reid G. Fordyce, research chemist, Central Research Division, Monsanto Chemical Co.

Texas – Nov. 2

Baker Hotel, Dallas; meeting, 8:00 p.m. Speaker: Mac Short, vice-president, engineering, Vega Aircraft Corp., and president, SAE. Guest: John A. C. Warner, secretary and general manager, SAE.

Wichita – Oct. 6

Allis Hotel; dinner 6:30 p.m. Subject: Hydraulics as Applied to Aircraft. Speakers: Orrin R. Broberg, Southwest Engineering Service Representative, and Lewis M. Horvath, Burbank Engineering Service Representative, Adel Precision Products Corp.

SECTION ROUND-UP

Canadian . . . D. B. McCoy, general sales manager of the Steel Co. of Canada, Hamilton, was speaker at the annual Hamilton Meeting of the Section on Sept. 24. It was a dinner meeting at the Hamilton Golf and Country Club at Ancaster.

Major N. B. Capes, staff officer at Royal Canadian Ordnance Headquarters, Ottawa, as principal guest speaker on May 28, outlined the growth of the Canadian Ordnance Corps. Following are excerpts from his talk which we recently received:

. . . The Ordnance Branch of the Army is responsible for the maintenance and life of military vehicles which now play such an important role in modern warfare . . . Ordnance functions with four echelons overseas: (1) unit, (2) replacement of units, (3) repair of units, (4) major overhauls . . . In Canada the corps operates with only the first and fourth echelons.

Cleveland . . . Former Flying Tiger Kenneth Jernstedt, D.F.C., spoke before members and guests at the Sept. 13 meeting. At the age of 26, Mr. Jernstedt has piled up a record of more than 200 hr in the air in combat service with the Flying Tigers in the Far East. He returned to the United States in July, 1942, to become experimental test pilot for Republic Aviation Corp. Mr. Jernstedt spoke highly of the Japanese Zero fighter plane as well as the Japanese fighter pilot. He said that the fighter plane of the United States sacrifices maneuverability for greater speed, fire and armor for the safety of our pilots. Concerning his experiences as a test pilot, Mr. Jernstedt said that for production flight tests most of the pilots have had military training and fly approximately 50 hr per month. All of the experimental test pilots have had military training, he said, and three with his company have had actual combat experience.

Metropolitan . . . SAE Past-President Edward Warner, vice-chairman of the Civil Aeronautics Board, discussed "Development of Air Regulations and Their Effect on Future Design and Operation" on Sept. 9. Digest of the paper and discussion which followed are published in this issue of the *SAE Journal* beginning on p. 26.

Milwaukee . . . Fall activities teed off at the Meadowbrook Country Club with golf commencing at 1:30 p.m., followed by dinner at the club house in the evening.

Mohawk-Hudson . . . Clambake at the home of Ralph DeLaney, at Vischer Ferry, N. Y., ushered in the first meeting of the season. As a special feature the film "Teamwork," showing the owner-driver mechanic cooperative program in full color, and produced by the Timken-Detroit Axle Co., was shown.

Northern California . . . James B. Kendrick, whose aerodynamics background covers the field from gliders to heavy bomb-

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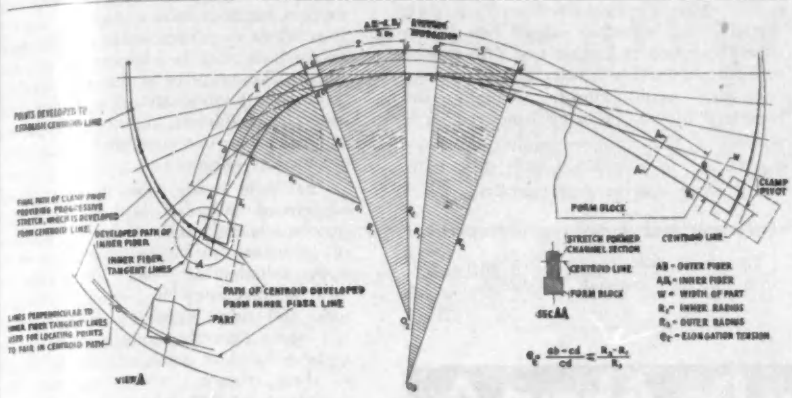

Fig. 2 – Geometrical layout for the stretch-forming of a cap strip to be used as the leading edge of a wing tip

Use of Stress Strain Theory in Parts Making

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compiled to give the elongation in ¼-in. and 2-in. gage lengths for various materials. Further studies were made to determine the allowable elongation over larger gage lengths; for example, 12, 36, and 48 in., and which would be applicable to forming large sheets on the stretch press. It was found that for larger gage lengths, the average elongation dropped down considerably, in some cases approximately 50% that of the 2-in. gage length value.

In these various gage lengths for 24S-T, we can expect:

1. Up to 40% elongation if only a very small area of the sheet is deformed.

2. Approximately 18% when the forming occurs over 2 in.

3. Only 9 or 10% can be obtained when large sheets, such as fuselage skins or cowl panels, are stretch-formed.

A few years ago, an effort was made to form parts directly from S-T material, which had previously been formed in the annealed temper (S-O and then heat-treated). By so doing, troublesome heat-treat distortion could be eliminated. In order to proceed with this program, it was desirable to determine the minimum bend radius that could be used for 24S-T, thereby not necessitating design changes of S-O parts that already had a suitable bend radius.

After determining the minimum bend radius, there was still doubt as to what effect the work hardening had had on the bend and how it affected the fatigue life of the part.

Many specimens of various gages were formed on their minimum bend radii and subjected to vibration tests. A machine was constructed to hold these bentup specimens with one leg held stationary while the other oscillated until failure occurred. When the results were compared with specimens formed in the S-O condition and heat-treated, it was found that those formed from the S-T stock had the longer fatigue life.

Bar forming is one of the newer techniques used in forming aircraft extrusion and preformed sections. A bar contoured to allow for springback is developed and a straight or pressure bar is used to force the preformed section against this developed contour as the two pass between the large driven rolls.

Fig. 1 shows a "T" extrusion being shaped to an irregular contour in one pass through the machine. The amount of springback added to this bar is necessary to produce a part that opens to approximately 180 deg. The flange angle is also changed during this forming process.

Fixtures are needed to check each part individually as it comes through the machine, as springback characteristics vary. These variations may be caused by one or a combination of the following: hardness of material, cross-sectional tolerances, pressure of rubbing block or amount of lubricant used, and, in some cases, the general technique of the operator.

Stretch forming is one of the most interesting techniques developed during the past few years to form aircraft parts. The preliminary action is the elongation of elements in the neutral plane. The limiting factor in a cap strip to be used as the leading edge for a wing tip is the area that has the sharpest radius of curvature. This area, shown as segment 1 in Fig. 2, requires the outer fibers to elongate near their maximum limits, as the inner fiber *cd* must be held in tension during the forming cycle in order to prevent excessive springback or buckling upon release of the tension of the forming force. The geometry of this area is the projected width of the part W divided by the inner radius R_1, which gives a difference of 12% from the inner fiber to the outer. The inner fiber should be held at a minimum of 0.5%. If this were maintained, the outer fiber would be forced to stretch 12.5%. The part with an irregular contour such as this, with some areas sharp and others relatively flat, requires sensitive adjustments in the forming fixtures. During the forming cycle, the clamp jaws must follow the developed path established by the geometrical layout shown in Fig. 2. In order for the clamp to follow this predetermined path, it is necessary to pivot the clamps off-center. The movement of the clamp inward is governed by the lever actuated by the form block as it rises. Without a special cam arrangement, only an approximation of the true clamp path can be achieved by this method, but the results achieved were within the permissible forming limitations.

An effort has been made to present these springback phenomena in a very simple manner. Past experience has shown that if the theory of elasticity as it occurs during forming were better known by those who design and plan aircraft parts, much time and material could be saved.

Lubricating Oils and Lubricants

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neers more familiar with the intricacies of effective lubrication to be as responsible as abrasion, or more so, for wear occurring on bearing surfaces.

As loads have increased and as bearings transmitting increasingly larger loads have come into existence, it has been found necessary to use, in conjunction with the normal lubricating oils, additions of this kind, which today are known as "additives." The lubarometer has proved itself to be invaluable, as with this instrument it is possible to determine the actions of the lubricating film easily and exactly, under completely controlled but widely varying conditions in a bearing composed of any combination of metals or alloys.

Hydrodynamic Theory

It has become the easiest way to avoid controversy to recognize the coefficient of friction to be a function of film viscosity, speed, and pressure. Increase in viscosity, speed, and bearing pressure being the same, of course merely means the increase in internal friction of the lubricant film. As speed is increased, the friction goes up, exactly proportional to the increase in speed, provided that temperature remains the same, which, however, never is the case. Bearing pressure increases the amount of friction in full, fluid film lubrication, because the viscosity of the lubricant increases with the pressure. Some of the differences are due to the structure of the actual metal surfaces constituting the bearing. Another factor has to do with the effects of surface energy at the interfaces between the lubricant and metals. All of these factors have been recognized, but no exact measurements have been made up to the present.

Probably 98 to 99% of all lubrication is purely in the field of hydrodynamics. All machinery under a reasonably good rate of motion is lubricated by the effect shown. In other words, due to the motion alone, provided sufficient lubricant be present in the bearing and a constant feed maintained, the oil is swept into the bearing by that motion.

Oiliness

The first requisite of an oiliness compound to be mixed with a less oily hydrocarbon oil is that it must impart to such oils or other lubricants the ability to spread upon and cling tenaciously to metal surfaces. It also should not cause corrosion of the metals and it should have as good stability against oxidation as the main body of the oil. When hydrocarbon oils are not protected by an antioxidant or by so-called oiliness materials of fairly high potency that form boundary films on the metal surfaces, they oxidize more or less rapidly and produce corrosive acids in exactly the same way that

hydrocarbons are oxidized commercially for the production of various artificial fats. The low-molecular-weight acids, formic and acetic, are highly corrosive. High-molecular-weight acids are good corrosion preventives.

To form an effective boundary film, good oiliness materials must be selectively segregated out of the mixed lubricant by reason of their high polarity or attractiveness for the metal surfaces, upon the metal surfaces and protect those metal surfaces against fatigue, abrasion, and corrosion.

It must be understood that boundary films between metal surfaces may appear to be considerably thicker than they really are. This is probably due to the fact that most metals attract film-forming materials to their surfaces, and therefore where two metals closely approach each other two films will be formed, thus giving greater protection than one film would afford. Actually, the boundary film is probably composed of a number of films, aligned against the bearing surface in accordance with their individual affinity for the metal surfaces.

Detergent and Anticorrosive Properties

The high polarity and increased capillarity of the materials produced by the oxidation of petroleum result in their seeking out metal surfaces to such an extent as to result in the displacement of other materials which may be clinging to such surfaces. This property of detergency, as it is commonly known, results in a very high order of cleanliness in internal-combustion engines where oils containing the products are used as lubricants.

The high anticorrosive property of the oxygenated hydrocarbons has also resulted in considerable improvement in that type of lubricant usually known as top oil or upper cylinder lubricants. Tests show the wear to valve assemblies, cylinder walls, pistons, and rings, occasioned by the minute but highly corrosive products of combustion to be reduced as much as 98% by the use of these relatively newly developed compounds in the fuel, whereas with the use of straight mineral oil alone four-fifths of the wear originally occurring still obtained.

This single, highly desirable property of the compounds has also resulted in the use of enormous quantities as corrosion preventives to protect all manner of metals and alloys both in use and storage. This discovery was made at the Bureau of Standards. Beginning about five or six years ago this use has spread until today the materials are sold in innumerable combinations for the protection of all types of metals and alloys under every conceivable condition of use and storage. Certain of the compounds are indeed the subject of specifications by the Federal Government for this purpose.

Speculations on Future Regulations

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The alternative would be a certification of actual take-off distances under standard conditions, to clear the ground and also to reach the altitude of 50 or 100 ft.

To the pilot, landing distance is more important than stalling speed. It might be reasonable to allow the manufacturer of non-transport aircraft with power-off stalling speed up to a maximum of 70 or 75 mph for a flap condition corresponding to a full-power rate of climb of at least 300 fpm.

In respect to vision, standards of the future must be more stringent than in the past. I am sure it ought to be physically impossible for two aircraft to be in such a relation to one another that they can come into collision, while traveling straight or moderately banked courses, without either pilot ever having been able to see each other.

In framing expectations for the future in respect to scheduled transport safety, we start with the record already made. It has been remarkable. I see no reason why we should not reach a fatality rate of 1:100,000,000 passenger-miles within a short time after the war. The rate has dropped from about 16, to 7.2, to 2.5 during the succeeding five-year periods since 1929.

Major opportunities for improved safety are to be found in air navigation facilities, communications, airports, weather forecasting, and operating practices. Equipment factors have been involved in a few. A cure

for one of the worst afflictions of the past 25 years seems to be close at hand in de-icing by heat. But the equipment failure hazard still remains a minor one.

There is a vast mileage of potential air routes all over the world for from 5 to 10 passenger capacity aircraft, although it is the giant airplane that catches the imagination. There will be a choice of having no air transport at all or airplanes with less appealing features and limited safeguards. The regulatory authority must decide whether such communities should be denied service, or whether they should have some service at lower standards.

Short of the extreme of using single-engine aircraft, there is a possibility of relaxing the standards of single-engine performance for twin-engine machines in use on local runs with light traffic.

DISCUSSION

A plea that the Government take a position more as adviser to the aircraft industry than that of policeman, in formulating regulations, was voiced by John Thorp, Vega Aircraft Corp. Manufacturers feel, he said, that they must have a more vital interest in the airworthiness of their products in a competitive world than the Government can have.

The thought that the amateur flyer isn't going to study a highly technical manual giving certified performance data was expressed by both Mr. Thorp and J. C. Leslie, Pan American Airways. Both discussers felt that the expense for tests required to compile such manuals for private planes would not be justified.

Consideration of predictable variations in operating conditions in determining loads a particular aircraft may carry also interested Mr. Leslie. Experience with aircraft operating over long distances where seemingly insignificant variations can produce enormous changes in payload, led him to affirm that such variations should be considered carefully.

Charles Froesch, Eastern Air Lines, Inc., said that in considering temperature variations as affecting performance, one must not go too far, or the complexity of application will become too great—daily variations could not be considered. He also felt that airplanes on feeder lines should be governed by more strict performance regulations, rather than less, as suggested by Dr. Warner.

The need for a study of the practicability of establishing nominal airport runway lengths, taking into consideration the airport altitude, runway surfaces, and mean temperatures, was envisioned by H. E. Hoben, American Airlines, Inc., as an extension of Dr. Warner's suggestion for taking into account the characteristics of landing areas in determining loads an airplane might carry for specific airports. Mr. Hoben also questioned the value of the new take-off regulations. He believes they will seriously penalize the operation of bimotor planes without effectively increasing their safety of operation.

The point that flexibility in air regulations is not an unmixed blessing was made by A. A. Vollmecke, Civil Aeronautics Administration, in a discussion read by H. D. Hoekstra, also of CAA. Not only the design stage, he said, but the whole expected life of the aircraft must be considered—the user must not be saddled with complications and restrictions that will hamper him throughout the life of his plane.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Aug. 10, 1943, and Sept. 10, 1943.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Frederick Kenneth Bloom (J), Arthur G. Moran (S M), Gene H. White (J).

Canadian Section: Joseph James Brown (J), Donald Caleb Gibbard (A), Edward Hammermaster (J), Arthur David Harris

(M), Paul Gilbert Jefferies (A), H. W. Jones (M), John Arthur King (A).

Chicago Section: Charles L. Adams (J), Ralph Fletcher Bonham (J), L. L. Colbert (M), Wayne J. Faust (J), William R. Gerber (M), Loren B. Grimsley (A), Marvin G. Nelson (M), William Edward Worley (J).

Cleveland Section: Marion Browning Crawford (M), John M. Davies (M), Robert Martin Davis (M), E. Gifford Emery, Jr. (M), Albert Hoye Godfrey, Jr. (J), Alfred C. Gunsaulus (M), Dwight L. Loughborough (M), Robert Ralph Sanker (J), John H. Seaton (M), Bruce M. Sheffer (J), Norman L. Wuerz (J).

Detroit Section: Albert Victor Apblett (M), Theodore G. Coyle (M), Edwin B. Jackson (A), Frank J. Koehl (M), Donald W. Main (J), Henry V. Pfetzing (J), Earl L. Ramsey (A), Earnest A. Sprow (J), David Ayars Stoddart (J), Laurence P. Sutley (M), Carl A. Underhill (A), Paul R. Vogt (J), G. E. Winters (A).

Indiana Section: Robert R. Allen (J), L. Eugene Easley (A), Ralph H. Everman (A), Robert Maxwell Williams (M).

Kansas City Section: Edgar F. Nason (M), E. J. Ziegler (M).

Metropolitan Section: Basil W. Brooks, Jr. (J), Frederick J. Demeterius (J), Vincent James Giangrande (A), Harold E. Hoben (M), Richard Bradford Hook (J), Fred L. Kolb, Jr. (J), Barney Lifshey (M), Joseph F. Martin (M), Albert S. Ogden (J), Giles W. Painter (J), Joseph E. Rocky (J), Marshall Sangster (A), Martin P. Schira, Jr. (A), Emil Schnell (A), Murray M. Scott (J), Leon K. Shanack (A), Edward D. Shores (A), Faulkner Crain Thomson (J), Larry Weinstein (J).

Mid-Continent Section: Lester Lee Helm (A).

Milwaukee Section: Lewis H. Collison (J), Roy W. Johansen (J), George W. Mork (M).

Mohawk-Hudson Group: M. J. Severino (M).

Muskegon Club: Edwin R. Clarke (M).

New England Section: Fred L. Brugger (J), Johannes Almon Heyliger (A).

Northern California Section: Howard C. Bozeman (A), Lt. Raymond E. Brown (A), L. J. DeSaules (A), Leland B. Mixon (A).

Northwest Section: Lt. Harry Carson, Jr. (J), C. Edwin Johnston (A), J. Donald Marx (A), C. Fred Naylor (M), Ray E. Robinson (A), Edward C. Wells (M).

Oregon Section: Vern W. Bailey (A).

Philadelphia Section: T. C. Kuchler (M), Merrill A. Lott (S M), Harold J. Schramm (M), George John Stradtner (J), T. W. Tinkham (M).

Pittsburgh Section: W. J. Kittredge, Jr. (A).

Southern California Section: H. C. Akerberg (A), J. C. Armeling (A), Thurman H. Colgrove (A), John E. Crossland (A), Harold Millard Harrison (M), Disbrow Pettit Johnson (J), William Powell Lear (M), Louis P. Merandi (J), G. Russell Noble (M), Arthur B. Olmore (J), Paul M. Palmer (A), Frank Radovich (M), Lauren E. Rampton (A), Charles Henry Richart (J), Arthur Schlosser (M), J. P. Seamons (M), Dean Robert Thomas (J), William S. Thurlow (A), James G. Woodruff (M), Frank S. Wyle (J).

Southern New England Section: Chester M. Jedrziewski (J), Theodore M. Matson (M), Edwin L. Rush (J), William Maxwell Scranton (J).

Southern Ohio Section: Warren Lahners (J).

Syracuse Section: Youston Sekella (M), Norman Voekel (J).

Texas Section: Fred Boatright (A).

Twin City Group: Lynn G. Barnes (M), William Henry Furst (M), Carl R. Reller (M).

Washington Section: Philip Edward Banfield (A), Lt. (jg) Robert F. Freitag (J).

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APPLICATIONS Received

The applications for membership received between Aug. 10, 1943, and Sept. 10, 1943, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Canadian Section: Ellis Stephen Byers, T. J. Delaney, Lorne Cavell Elder, Alfred A. B. Eve, James Gordon, William D. Howe, Arthur C. Pullen, Arthur J. Sales, Leonard George Singer.

Chicago Section: Thomas Richard Blakeslee, John C. Buckwalter, Carl Paul Kabat, Gerald J. Kenaley, R. E. McGee, Carl G. Nesholm, Carlton F. Pence, John M. Reinertson.

Cleveland Section: W. F. Aylard, Marvin Edward Hartz, J. H. McDuffee, Jr., S. Harry Norton, James M. Stankard, Jr., Ralph C. Thompson.

Colorado Group: Carl A. Norgren.

Detroit Section: LeRoy W. Dahlberg, James K. Fulks, Richard B. Hooper, John E. Kaake, W. M. Phillips, H. A. Sperlich, Ulysses L. Thomas.

Indiana Section: Clifford L. Gough, Maurice H. McKinnon, Paul Ellis Parsons, Ernest L. Russell.

Kansas City Section: Ensign Stephen Farley Rossiter, Jr.

Metropolitan Section: James D. Abeles, Yura Arkus-Duntov, Zachar Arkus-Duntov, Henry Balfour, Percy H. Ballantine, Kenneth W. Barkman, Matthew A. Batson, Karl Birken, George Candeli, William G. Dallas, Stanley Joseph Gut, Stephen T. Iannaccone, Herman G. Koch, Jules P. Kovacs, Ralph R. Layte, Donald M. McDowell, William C. Mearns, Constantine Z. Michael, John Edwin Miller, Eduard Carl Petry, Howard Irwin Podell, Arthur George Pogmore, Lt.-Col. William L. Purcell, John F. Ross, John William Sinclair, S. Bruce Somervell, Martin J. Stolz, Stephen J. Tracy, Sidney Haskins Webster.

Mid-Continent Section: R. K. Adams.

Milwaukee Section: Arthur John Kauper, George M. Walraven.

Mohawk-Hudson Group: Edward E. Berg.

New England Section: Selby Fenimore Greer, Guy P. Jackson, John D. Works.

Northern California Section: A. G. Baxter, Dale Denham, Lt. Robert Louis Douglas, Walter Ambrose Hunting, L. Dean Rouland.

Northwest Section: Ford D. Archer, Clarence Adren Dyer, W. R. Hubka, William J. Miller, Zotique W. Therrien.

Oregon Section: L. C. Fogg.

Peoria Group: Marcus A. Clements, Richard S. Frank, Raymond L. Mussatto, Norman M. Nelson.

Philadelphia Section: Lt. Jack G. Kuhrts, Bruno J. Salvadori, John H. Tipton.

Pittsburgh Section: Warren W. Jones, Sr., W/O William E. Walters.

St. Louis Section: T. Joseph Flamm, Herman Plew.

Southern California Section: Ernest V. Berry, George Vincent Carey, John Robertson Clifton, Alfred A. Gilford, M. W. Irvine, Martin Joseph Murphy, Jr., Walter M. Neal, Parameswar Nilakantan, Hugh Otis Pierce, Wesley F. Rhodehamel, Jerry Rons, Harry A. Skaglund, Mitchell M. Thorngate, Andrew J. Urness.

Southern New England Section: Joe O. Dean, Roy Bradley Fisher, J. Warren Frame, III, Karl P. Hanson.

Southern Ohio Section: Thomas J. Martin, Jr.

Texas Section: Raymond W. Snowberger.

Twin City Group: Victor N. Albertson, Robert E. English.

Washington Section: Feodor F. Khimoushin, Herbert Billie Mills, Jr., Bertram A. Totten, Shou Chin Wang.

Outside of Section Territory: Rolland L. Anderson, Robert G. Beavers, Bruce C. Benedict, Jr., Alonzo M. Harp, Carl H. Linn, Lt. Charles Allen Melton, Theodore William Nelson, Philip Alden Sidell, E. H. Viele.

Foreign: Henry Ward Allison (New Zealand), Eric Harry Leach Cooper (England), Andrew Mathis Kamper (England), Humphrey Whitfield Semmence (England), Ramalal Prieuvadan Guy Harry Sah (England), A. W. Vickers (England).

New Members Qualified

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Wichita Section: Robert B. Short (J).

Outside of Section Territory: Leonard L. Conopa (A), Fellows Gear Shaper Co. (Aff.) Reps: Cecil M. Peter, G. H. Sanborn. James B. Fretz (M), John Letts (J), Neil R. McLeod (M), Charles W. Pavlista (A), Milford D. Stewart (M), Major Edgar A. Stoddard (A).

Foreign: David Dundas Arnott (F M), (England), John Herbert Willans (F M), (England).

SAE T&M Committees Report to Army, ODT

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cooled. All recommendations are pointed to that single objective. These reports, like all others, are based upon operating experiences garnered from the whole country.

Tests Augment Surveys

The reports are developed not only from practical operating experience, but from thorough, practical tests. Technique of metal-spraying worn brake drums is a case in point. Brake drums reconditioned by this method actually are in use under observation in various sections. The tests so far have indicated that fears of an inadequate bond were groundless; the chief difficulty is heat-checking. Other experiments are being made in an effort to overcome this handicap.

Tests with metal-spraying new seats on engine valves are being made. Reports so far indicate that the reconditioned faces have a service life equivalent to 50% of that of a new valve. Data are being developed on welding broken axle shafts. Indications from experience in actual use are that this comparatively new – and none too highly regarded – technique may afford substantial savings of materials and operating economies.

Preparation of these reports is neither a brief nor an effortless operation. The task involves surveying maintenance experience and procedure, cataloging ideas and techniques, correlating ideas and opinions, and, finally, a meeting of engineering minds on a mutually satisfactory basis. These routine operations of a cooperative professional organization, such as the Society of Automotive Engineers, are supplemented by ODT's further and final review.

This process of compiling and correlating the experiences of maintenance engineers in Louisville, Ky., and Los Angeles, Calif., in Dallas, Tex., and Detroit, Mich., is tending to develop and to establish sound, standardized techniques of automotive maintenance. The time is both ripe and right, for never since motor vehicles came into general use have American operators faced an economy of scarcity. They have been reared in an economy of automotive plenty and of free enterprise. Always before, when repairs, parts or services were needed, they

were, or shortly thereafter became, available.

Conditions now are reminiscent of the "get out and get under" days, when those who operated motor vehicles were forced to rely upon ingenuity for lack of technical knowledge. Modern circumstances afford the advantageous possibility of pooling knowledge and ingenuity.

International Aero Standards

SAE Cooperative Efforts Are Gaining Impetus

INCREASED impetus on international collaboration in developing standards has been disclosed in recent weeks in the field of aeronautical engineering and metallurgy.

SAE and other U. S. Standards representatives were invited to attend the Aircraft Standards Committee of the Canadian Engineering Standards Committee, Ottawa, Aug. 19 and 20. Plans were laid for closer cooperation between the two countries.

In addition to recent visits of British aeronautical standards groups to this country, A. L. Stewart of the Standards Association of Australia has visited SAE headquarters to study the details of the SAE program. Australia has been given permission to publish SAE aeronautical standards and materials specifications.

The SAE has undertaken the development of an interchangeability list or table, showing the AMS numbers with similar A-N, Federal, and other designations of similar alloys. This will also show the predominant chemical compositions and physical characteristics specified in the AMS. This was requested of the Society by representatives of the Society of British Aircraft Constructors and the Ministry of Aircraft Production.

All SAE aeronautical standards, recommended practices, and materials specifications are being forwarded to the British Ministry of Aircraft Production through the British Air Commission, Washington. British standards information is being supplied to SAE committees through the same liaison.

Army Air Forces Needs Inspectors

THE Materiel Command of the Army Air Forces needs additional inspectors to be assigned to airplane, engine, propeller and instrument plants in the Eastern Procurement District, which includes the New England States, and the states of New York, Pennsylvania, New Jersey, Delaware, and Maryland.

Men must be over 37 years of age. If under 38, they must have dependent children. Men of fine character and patriotism are particularly desired. Technical training and some mechanical experience are desirable, but not absolutely necessary.

An AAF Inspector's School is maintained in New York where all inspectors are trained before being assigned to contractors' plants.

Inquiries should be addressed to Lt.-Col. W. S. Johnston, district Inspection Officer, Eastern Procurement District, Materiel Command, Army, Army Air Forces, 67 Broad Street, New York, N. Y.

Report Rubber Savings In Gun Carriage

A gun motor carriage, now being manufactured by the Ford Motor Co., is one of the latest vehicles to come under the scruti-

Cooling Systems Advisory Group

Members of the SAE-Ordnance Vehicle Maintenance Committee on Cooling System Maintenance manage to maintain operating temperatures even on the stifling afternoon of Aug. 18 in New York. L. to R.: H. L. Corkran and E. H. Keller, E. I. duPont de Nemours & Co.; H. A. Reynolds, Harrison Radiator Division, General Motors Corp.; F. R. Archibald, National Carbon Co., Inc.; S. G. Page, Equitable Auto Co.; Capt. R. O. Slattery, Ordnance Department Tank-Automotive Center; Chairman D. H. Green, National Carbon Co., Inc.; Capt. Robert Sawyer, Ordnance Department, T-AC.; Edward Chadwick, Little Falls Laundry Co.; J. J. McCarron, Consolidated Telegraph and Electric Subway Co.; H. M. Smith, Connecticut Railway and Lighting Co., and Lewis R. Gwynn, Jr., Railway Express Agency. This project was requested of the SAE by the Army Ordnance Department

nizing eyes of the Combat Vehicle Subcommittee of the SAE War Engineering Board Rubber Committee. At the request of the Ordnance Department, the Subcommittee has completed a detailed study of the possibilities of reducing the amount of rubber used in this vehicle.

The report makes specific recommendations of substitute materials for 58 rubber parts used on the gun carriage.

The members of the Combat Vehicle Subcommittee are: J. H. Doering and J. P. Wilson, Ford Motor Co.; A. J. Kearfott and W. M. Phillips, Research Laboratories, General Motors Corp.; R. L. Wheeler, Chrysler Corp.; and R. B. Wuerfel, Chevrolet Motor Division, General Motors Corp.

Bissell Manager Of National SAE Meetings

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important SAE technical committees concerned with the SAE War Program, and for the Diesel Engine, Fuels and Lubricants, and Production Engineering Activity Committees.

Mr. Bissell will assume his full responsibilities beginning at the time of the 1944 Annual Meeting in Detroit next January. *Until that time the staff men currently charged with responsibility for the various meetings scheduled between now and the time of the* 1944 *Annual Meeting will continue to exercise those responsibilities* with Mr. Bissell assisting.

Section Round-Up

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ers, and who is aboard each newly-designed plane from the Vega plant on its test flights, was well qualified to speak about "Methods of Flight Testing," presented at the Sept. 14 meeting.

Northwest . . . Fused bond metal spraying was explained by John F. Meduna to the members and guests at the Sept. 9 meeting. Wright Aeronautical's film, "Cyclone Combustion," was shown and dinner at Crawford's Seafood Grill preceded the meeting.

St. Louis . . . Edward H. Sieber of Kirkwood, who has just returned from a year in the American Field Service with the British Eighth Army, gave a short after-dinner talk on the performance and maintenance of automotive vehicles in warfare. Main-speaker-of-the-evening Walter Forster, aeronautical engineer for Curtiss-Wright, presented "Converting Today's Military Airplane Transports for Post-War Passenger and Cargo Use."

Washington . . . The Chinese Room of the Mayflower Hotel served as a setting for the "warm-up" stag party which the Section gave on Sept. 13 to acquaint "old members, new members, and imported members from other Sections."

Colorado . . . Heard Telfer E. Norman discuss "Recovery and Use of Molybdenum and Its Relation to Recent Metallurgical Developments." Mr. Norman, who is metallurgical engineer for the Climax Molybdenum Co., told the story of Climax all the way from 1916, when Max Schott, then Western manager of the American Metals Co., Ltd., became interested in a molybdenum deposit in Colorado, up to the present.

Muskegon . . . On Aug. 14 the Club held its Annual Summer "Little White Sulphur" Meeting at Harold Rosen's home, Edgewater Beach on Muskegon Lake. Members and prospective members spent the early part of the afternoon in getting acquainted and dinner was served at 6:30. After dinner Dr. Harold Closz of Muskegon, showed colored movies of his travels in Alaska and British Columbia.

Twin-City . . . SAE Past-President A. T. Colwell, president of Thompson Aircraft Products, presented "Recent War Engineering Developments" before the dinner meeting on Sept. 2 at the Curtis Hotel. Summary of Mr. Colwell's talk will appear in the November *SAE Journal*.

Oregon Section Map-Making Display

Brig.-Gen. C. L. Sturdevant, U. S. Army, assistant chief, Corps of Engineers, Washington (extreme left), and Section Chairman Z. C. R. Hansen (second from left), are shown inspecting a map-making display at the July meeting of the Oregon Section. Civic and business leaders attended the reception and dinner which preceded the meeting at which Gen. Sturdevant spoke about the Alaska Military Highway